Automated Commercial Environment (ACE) Cost-Benefit Analysis

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Executive Summary

Purpose

In accordance with the General Accounting Office (GAO) recommendations, the U.S. Customs Service (USCS) has performed a cost-benefit analysis (CBA) to determine whether the development and deployment of the Automated Commercial Environment (ACE) is a sound financial investment. U.S. Customs Service has also evaluated the alternative of enhancing the legacy system, ACS, to achieve functionality required by the Modernization and Informed Compliance Act (Mod Act) and other regulations. The purpose of this document is to report the detailed costs and benefits associated with developing and deploying ACE, including a risk analysis to account for the inherent uncertainty in these estimates. An analysis of modernizing ACS, including the significant issues and costs associated with that modernization approach is being documented. In addition, because the benefits to the trade community and society are of particular importance, this analysis sought to quantify those benefits.

Other recommendations made by GAO, such as analyzing the incremental costs and benefits of developing and deploying ACE, or analyzing other ACE alternatives, are not directly covered in this analysis. However, under the current ACE acquisition strategy, a prime contract will be awarded to an SEI accredited contractor to study the ACE requirements and develop a detailed program plan for developing and deploying ACE. The prime contractor will be responsible for analyzing alternative ACE solutions, and for developing a system architecture that is technically and operationally feasible. The prime contractor will also examine the migration from ACS to ACE and develop strategies for a seamless transition to the new system. Since Customs realizes that an optimum approach for developing and deploying ACE cannot be adequately defined at this time, the migration strategy will address the incremental approach for deploying ACE. At that time, each ACE increment will be will be individually cost-benefit justified. This approach is considered to significantly reduce technical, programmatic, and cost risk for the overall program implementation.

Background

ACE will provide the essential upgrade to an automated system that can no longer meet the mission demands of the U.S. Customs Service. The explosive growth in trade, the age and instability of ACS, and the mandates of the Customs Modernization and Informed Compliance Act (Mod Act) and other regulations are factors driving the development of ACE. The debate is no longer over whether or not an upgrade is required but rather over how quickly and in what manner ACE must be deployed to enable the most effective and efficient accomplishment of the Customs mission. The Mod Act was a key piece of legislation that provided the legal foundation for redesign; ACE will provide the automation necessary to actually accomplish it.

ACE has strong support within the trade community, primarily due to the significant benefits of moving to a modern, account-based automation system. Because the trade community is

itself evolving toward automated, paperless processes, there is expectation that Customs will evolve its processes to meet the demands of the trade community and the rapidly increasing volumes of imports. With the development and deployment of ACE, the trade community will benefit through lower transaction processing costs, better compliance with trade and tariff regulations, and improved flow of imports across international borders. ACE information flows will eliminate redundant data collection, reduce filing time, and reduce the amount of effort currently required to track and adjust transaction-based activities. Other benefits to the trade community include on-line access to cargo and filing status reports, enhanced account management, just-in-time filing, and uniform processing at all ports of entry.

Results in Brief

As part of the GAO recommendations, Customs was requested to develop more reliable estimates of what ACE will cost to build, deploy and maintain, including a rigorous risk analysis to account for the inherent uncertainties in those estimates. In addition, Customs was requested to develop a cost-benefit analysis to ensure that the benefits of implementing ACE were justified by its costs. The following sections summarize the principle findings of the CBA.

Overall Cost-Benefit Analysis Results

The CBA documented herein is conducted in accordance with guidance from the Office of Management and Budget (OMB) Circular A-94, U.S. Customs Service Draft CBA Methodology, and generally accepted industry practice. Detailed cost and benefit estimates for an ACE alternative were developed using rigorous cost/benefit analysis techniques that incorporated data from Customs historical experience, subject matter experts, industry standards, and corporate knowledge. When appropriate, multiple analysis techniques were used to validate cost or benefit estimates. For example, to develop the estimates for application development, three independent parametric methodologies were used to estimate costs. Costs and benefits were then phased according to a four year development program and an 18-year operational program life. Finally, a risk analysis was performed to account for the inherent uncertainties in the cost and benefit estimates.

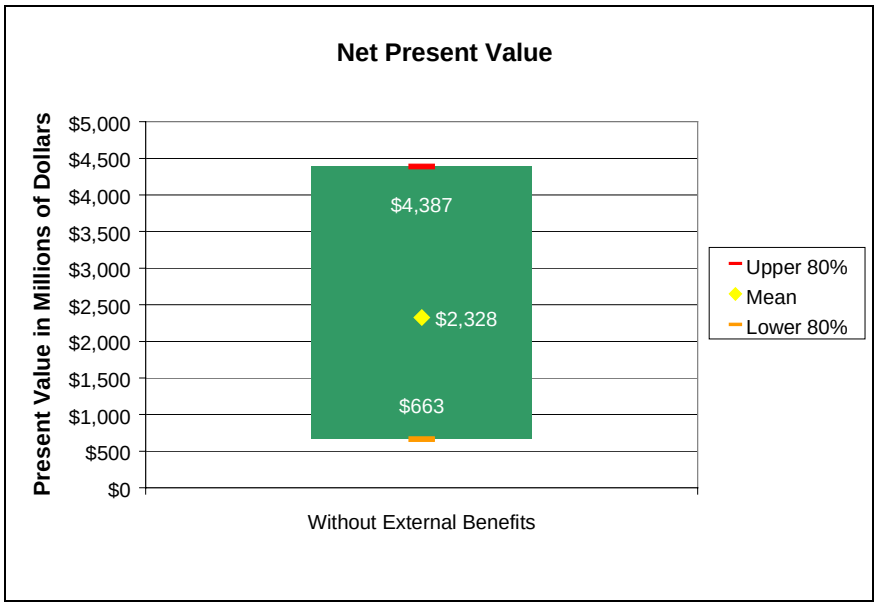
This CBA considered several financial metrics to evaluate the worthiness of investing in ACE. The primary metric examined is net present value (NPV), which compares the present value of ACE costs to the present value of ACE benefits. Whenever benefits exceed costs (i.e., NPV is positive), an investment is considered financially acceptable. Table E-1 provides the results of comparing ACE costs to benefits on present value (PV) terms without the inclusion of external benefits. In addition, the risk analysis showed that even at an 80 percent confidence level, NPV will be positive. The graph in Figure E-1 illustrates the confidence interval for NPV when calculated without external benefits.

Table E-1: ACE Cost-Benefit Results (without External Benefits)

	CBA Analysis Results		
		Risk Adjusted	
	Mean Value	Mean Value	Standard Deviation
Total ACS Life Cycle Costs (PV $M)	$1,193	$1,523	$35
Total ACE Life Cycle Costs (PV $M)	$1,820	$2,533	$48
ACE Benefits (PV $M)	$3,246	$3,338	$494
Net Present Value (PV $M)	$2,619	$2,328	$1,634

Note: NPV is calculated by subtracting the difference between ACE life cycle costs (PV) and ACS life cycle costs (PV) from ACE benefits (PV). The risk adjusted values include a risk premium to account for the inherent uncertainty in the cost and benefit estimates (Section 9 provides detail on the risk analysis approach).

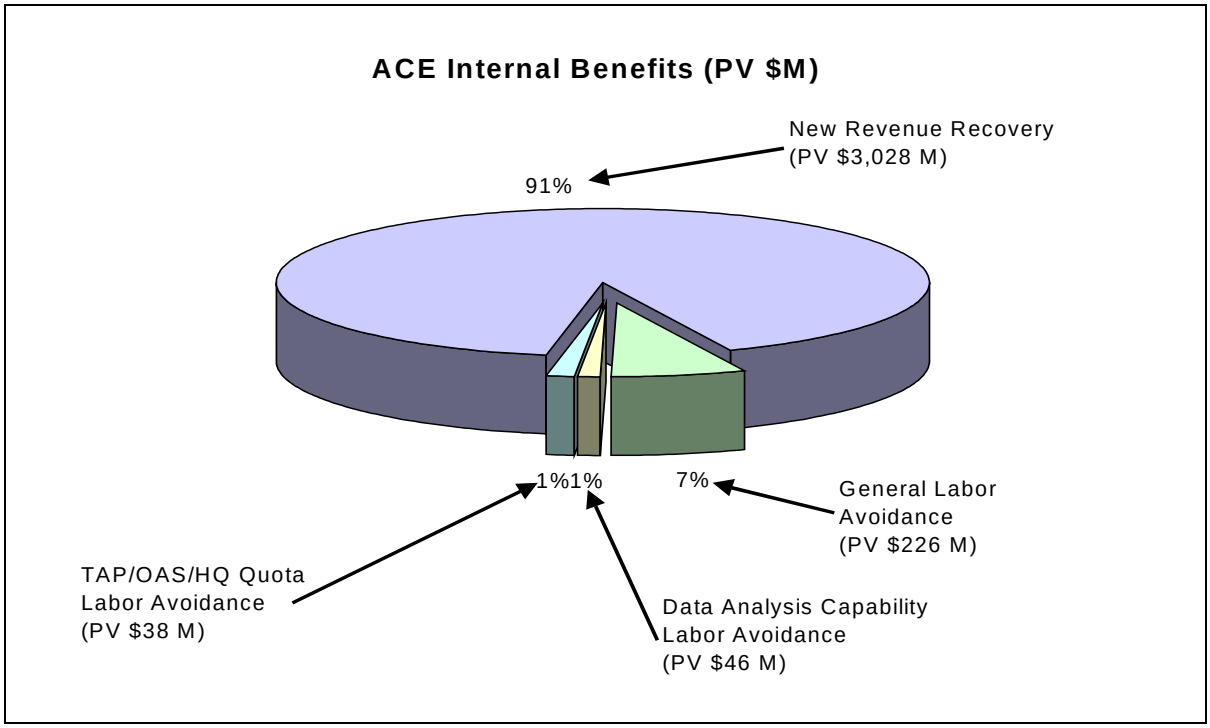
Figure E-1: Risk-Adjusted Net Present Value



ACE Benefits

The analysis of ACE benefits consisted of estimating both internal and external benefits, and included a risk analysis to account for the estimate uncertainties. It was determined that quantifiable internal benefits could be classified in five categories that capture improved revenue recovery and benefits associated with various labor avoidance or productivity improvements. Internal benefit findings resulting from benefit categories such as labor avoidance are often subject to scrutiny because labor savings often do not reflect a direct cash inflow, and thus may be considered a "soft savings." However, as the graph in Figure E-2 demonstrates, the overwhelming majority of benefits of ACE are estimated to result from revenue recovery; and only a small percentage accrue from labor avoidance.

Figure E- 2: Distribution of Risk-Adjusted Internal Benefits by Category



External benefits, although not traditionally included in a CBA, are extremely important considerations for several reasons. First, because of the close relationship of the trade community to the Customs' mission and objectives, the benefits accruable to the trade community, as a major stakeholder in ACE, must be considered in any modernization effort. Second, since one of Customs' primary missions is to protect the U.S. society from the inflow of hazardous products, narcotics and other contraband, it is important that societal benefits resulting from a modernized ACE be quantified to ensure that Customs' modernization efforts will serve in the public interest.

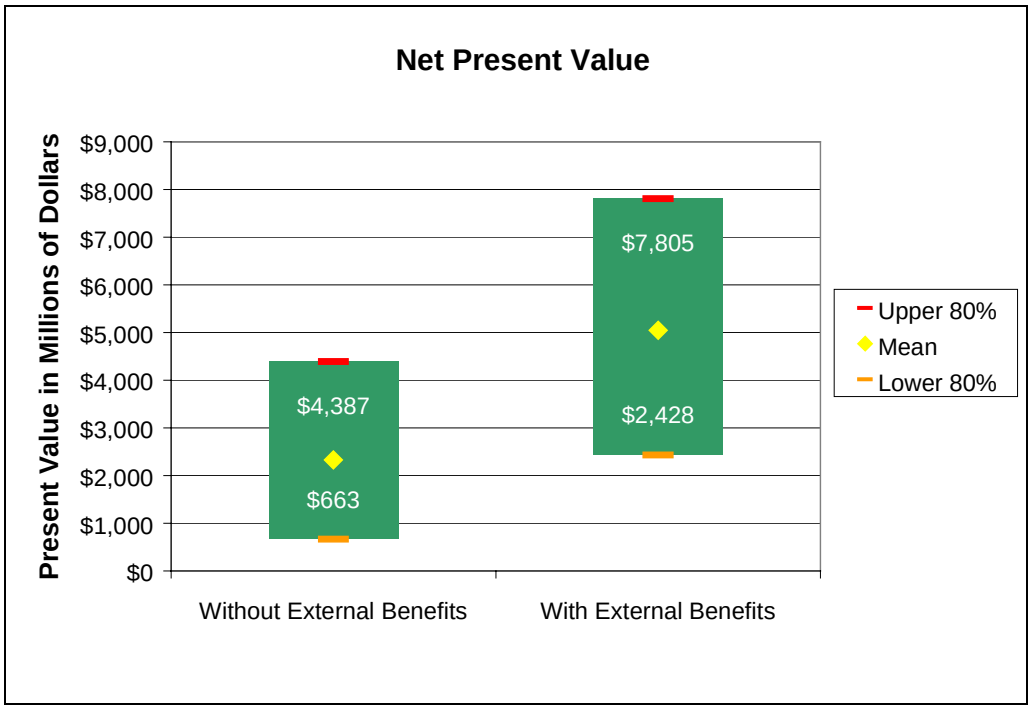
The results of this analysis show that external benefits attributable to an ACE alternative are significant and further support the development and deployment of ACE. It is estimated that over the 22 year life cycle of ACE, reduced transaction costs alone could benefit the trade community by as much as $973 million. In addition, societal benefits accruing from enhanced narcotic interdiction activities were estimated in excess $900 million over the same time period. When external benefits are included in the CBA, the case in favor of ACE development is even more convincing. As table E-2 shows, the CBA results with external benefits show significant support for developing ACE. Figure E-3 illustrates and compares the 80 percent confidence intervals for the NPV metric when calculated with and without external benefits. One can conclude, with high confidence, that the NPV of an investment in ACE will be positive and therefore is a financially acceptable investment.

Table E-2: ACE Cost-Benefit Results (Including External Benefits)

	CBA Analysis Results		
		Risk Adjusted	
	Mean Value	Mean Value	Standard Deviation
Total ACS Life Cycle Costs (PV $M)	$1,193	$1,523	$35
Total ACE Life Cycle Costs (PV $M)	$1,820	$2,533	$48
ACE Benefits (PV $M)	$5,125	$6,056	$2,183
Net Present Value (PV $M)	$4,497	$5,046	$2,185

Note: NPV is calculated by subtracting the difference between ACE life cycle costs (PV) and ACS life cycle costs (PV) from ACE benefits (PV). The risk adjusted values include a risk premium to account for the inherent uncertainty in the cost and benefit estimates (Section 9 provides detail on the risk analysis approach).

Figure E-3: Risk-Adjusted Net Present Value



Qualitative Strategic Findings

Beyond the quantitative justification summarized above, qualitative internal and external findings support an ACE modernization alternative, and have particular strategic significance. The principal qualitative internal benefit is that ACE brings the USCS trade management program into legislative compliance while increasing processing speed, data accuracy, system reliability, interoperability and user friendliness.

The proposed ACE system also offers significant technical and business advantages over the 15-year old legacy system. Beyond complying with the Mod and CFO Acts, the ACE system:

- Increases flexibility and enables a "plug & play" technical environment;
- Improves interfaces with the Trade & other government agencies;
- Increases productivity allowing faster information processing;
- Improves analytical capabilities;
- Supports new, enhanced business requirements; and
- Applies industry standard, competitive vendor support contracts to minimize development costs.

Qualitative external benefits also support replacing ACS. After interviewing and reviewing written responses from the trade community, three principal themes emerged. The first theme is that importers, brokers, manufacturers, carriers, and insurers view USCS as one part of the overall logistics chain and they want to modernize their systems to ensure that USCS is not an impediment to their business. Many companies are waiting for a new USCS system so they can complete this modernization, while other companies are in the midst of modernizing and need to know how they will link to Customs. The community believes that their way of conducting international trade has irreversibly changed and USCS must become part of the modernized trade process.

The second theme is that the current system must be replaced as soon as possible. The slowdowns and occasional system downtime have been enough to make system users aware of how bad things will be if the system fails completely. Therefore, the trade favors a system that achieves functionality sooner than later.

Finally, the trade community is not able to provide specific estimates of savings because ACE has not been fully defined to allow them to make those estimates. Some functionality that has been articulated, such as remote location filing and periodic entry summary payment, has been enthusiastically endorsed. Those changes are enough for the trade to conclude that there will be significant savings when an alternate system such as ACE is implemented.

Enhancing ACS is Not a Viable Alternative

The quantitative analysis of the alternative of enhancing ACS reached similar conclusions found in prior USCS studies. Simply put, the effort required to enhance the poorly-documented, transaction-based ACS architecture is significant. It is more than just the cost of documenting the legacy system that is cost prohibitive. It is the significant effort of first understanding enough about that system to understand how to begin to modify ACS and add the functionality required by the Mod-Act. Even with significant enhancements, it is not clear that all functionality provided by an ACE alternative could be achieved through enhancing ACS enhancement in a cost-effective manner. In addition, it was clear from the

analysis that a significant re-architect/re-design effort to achieve a modern, account-based automation system, that is flexible and maintainable for the future, would in essence, result in an ACE architecture, that was designed and implemented on top of a legacy system. This is not the optimum way to design or redesign a world class information system.

Recommendations

Based on the analysis documented in this report, it is recommended that Customs proceed with their current modernization plans to develop and implement ACE. The cost benefit analysis shows that the estimated benefits of ACE far exceed the estimated costs associated with its development, deployment, and associated life support. Furthermore, there are significant external benefits to the trade community and the U.S. society that support an investment in ACE.

As the first step in acquiring ACE, Customs plans to partner with a prime contractor that will be responsible for:

- Performing a detailed requirements analysis for ACE
- Analyzing alternative approaches to designing and implementing ACE, including the development of a detailed program plan for migrating from ACS to ACE;
- Analyzing appropriate investment decisions incrementally, including the use of disciplined processes to prepare realistic and supportable life-cycle cost and benefit estimates, with appropriate uncertainty analysis;
- Ensuring that each investment decision provides a favorable return-on-investment and compliance with Customs' architecture before making any investment decision; and
- Validating actual costs and benefits once an increment is deployed, to ensure that further decisions on subsequent increments are reasonable and cost-justifiable

Customs is mandating that the contractor be SEI accredited to ensure that adequate software development and management practices are in place. Customs has already started the contracting process, and firmly believes that the current acquisition approach meets GAO recommendations, and will significantly reduce technical, programmatic, and cost risk.

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1 Introduction

The United States Customs Service (USCS) engaged Science Applications International Corporation (SAIC) to perform a cost-benefit analysis (CBA) comparing the current trade management legacy system—Automated Commercial System (ACS)—to a proposed replacement system—Automated Commercial Environment (ACE).

This study evaluates the benefits and costs of an ACE alternative developed in four years relative to the current ACS system funded to maintain the existing level of functionality and performance. This analysis also determines the macro level investment implications of an ACE investment. From this foundation, future incremental analyses will establish the financial consequence of investing in various clusters of functionality.

1.1 Background

USCS has been a leader in applying new technology and improved business processes to generate operational efficiencies in support of the USCS mission. USCS was the first government agency to use an Automated Clearinghouse (ACH), expediting payments and facilitating trade. USCS also employed electronic data interchange (EDI) and launched a long-running campaign to use information technology (IT) to further improve and enhance business processes, create efficiencies, and increase service quality to the trade community.

ACS was developed as a transaction-based processing system. Over the course of ACS development and enhancements, one key success has been the Automated Broker Interface (ABI). This EDI process has significantly reduced transaction costs and increased the quality of service the trade community. It has also improved USCS productivity by optimizing the labor and technology mix.

USCS's modernization and automation initiatives began over 15 years ago, and since then, the benefits of automation have been overwhelmingly demonstrated. While activity levels at ports of entry have increased threefold since then, USCS employment has remained steady. At the same time, USCS has maintained a high level of compliance and enforcement and provided quality service to government and commercial stakeholders. However, as more pressure is placed on ACS, with constrained capacity, the prospects for future IT driven productivity improvements are limited. In the short-term, it is expected that gains in productivity will be realized in smaller and smaller increments and eventually level off. ACS is currently operating at over 90% capacity and has experienced incidences of downtime and brownouts. This situation establishes the need for significant processing capacity upgrades.

Trade and transaction volumes continue to grow and are expected to grow through the medium and long term. These volume increases place pressure on USCS resources, increasing the frequency of downtime and causing transaction delays for the trade community. The North American Free Trade Agreement (NAFTA), passed in 1993, substantially increased the flow of goods among the U.S., Canada, and Mexico and has further increased USCS activity levels.

The Customs Modernization and Informed Compliance Act (Mod Act) was passed as part of NAFTA recognizing that enhanced business processes are necessary to support USCS's expanded mission. The Mod Act established a program providing for the development of an automated and electronic system for processing commercial imports that spans the import process life cycle from manifest through liquidation. In addition, the Mod Act required USCS to administer and enforce regulations and rulings "in a manner that:

- Is uniform and consistent;
- Is as minimally intrusive upon the normal flow of business activity as practicable; and
- Improves compliance."

USCS is also charged with meeting the requirements of a range of other legislation that affects USCS business practices. These include the Chief Financial Officers Act (CFO Act) (1993), the Clinger Cohen Act (1996), and the Government Performance and Results Act (1993).

Since 1993, USCS has been enhancing ACS to address specific legislative requirements. To fully meet all legislative requirements, USCS designed ACE to support a fundamental shift in business processes. ACE features complement and leverage USCS business process reengineering (BPR) efforts (i.e., account-based processing, account activity logs, and workload management tools). These features, supported by a sophisticated database architecture and advanced data processing and storage capabilities, will enhance productivity and improve service to the trade community. This will allow USCS to perform its mission more efficiently and effectively.

1.2 Historic Perspective

Growing trade volume has increased pressure on USCS IT and labor resources in recent years. Over the past 15 years import trade activity has risen at an average rate of 8.28%.[1] ACS is currently operating at over 90% capacity, which has begun to cause delays and even temporarily shut the system down. Capacity problems and projections of continued growth are a serious concern. Periodic efforts to solve capacity problems have distracted USCS from efforts to solve the long-term strategic IT issues. A performance-based downtime analysis is included as supplemental information (see Appendix B). This analysis provides internal cost data associated with periodic downtime incidences and the expected costs of avoiding such events.[2] The following figures (Figure 1-1 and Figure 1-2) present the historical perspective of entry-related employment against entry activity. The figures demonstrate that ACS facilitated significant productivity gains.[3] The number of entry-related positions at USCS has remained relatively constant over the last 10 years while transaction volumes have more than doubled. However, as the system reaches capacity, creating more and more processing delays, the likelihood that these entries can be fulfilled with a static workforce is low.

[1] USCS ABI Reports: ACSR-ES-140, ACSR-ES-148, ACSR-ES-149.
[2] Details of the downtime analysis are documented in Appendix B, pp. B-18—B-23.
[3] The productivity growth trend from FY 1989 through FY 1997 reflects the impact of ACS following its full deployment.

Subsequent to the data collection period for the ACE investment analyses spanning the fourth quarter of 1998 and the first quarter of 1999, several ACS system enhancements have occurred.[4] The enhancements are expected to lessen system downtime and brownouts thereby decreasing some ACS life cycle costs. Because these enhancements occurred outside the data collection period they are not reflected in this investment analysis.

[4] Quarters are based on calendar year.

Figure 1-1: Employment and Entry Trends, 1989-1997[5]

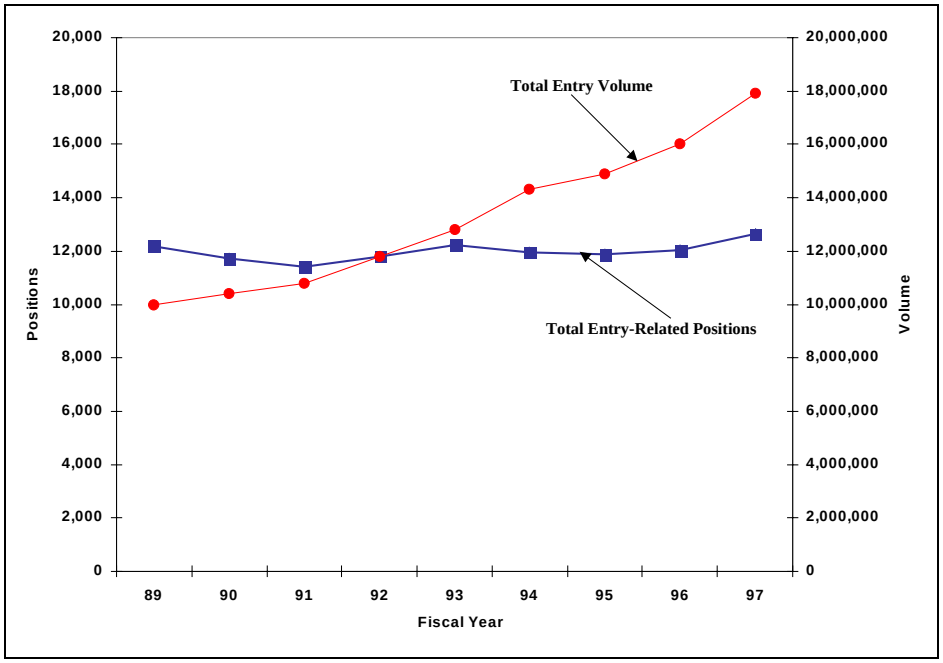
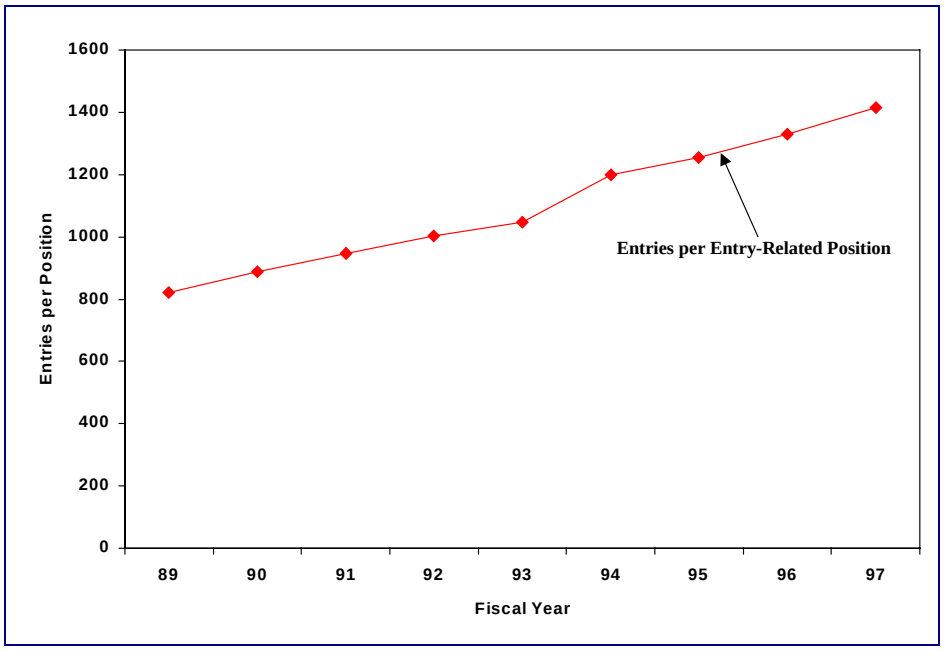


Figure 1-2: Workload Trends, 1989-1997



[5] Source: Budget of the United States Government, multiple years.

1.3 Document Structure

This analysis uses industry CBA standard methods and is organized accordingly into the following 10 sections and 11 appendices:

- **Section 1: Introduction—**Describes the purpose, background, and scope of the CBA.
- **Section 2: Project Vision**—Describes USCSs mission, ACS and ACE's relation to that mission, and the CBA's purpose.
- **Section 3: Methodology and General Assumptions**—Describes the process by which costs and benefits are calculated and lists global assumptions influencing the analysis.
- **Section 4: Alternative Description**—Contains summary technical descriptions for both ACS and ACE.
- **Section 5: ACS Cost Analysis**—Contains a summary cost analysis of maintaining the ACS systems' current level of performance and functionality. These costs are the basis for comparison to ACE costs and benefits.
- **Section 6: ACE Cost Analysis**—Contains a summary cost analysis of ACE performance and functionality.
- **Section 7: ACE Internal Benefit Analysis—**Contains a summary analysis of benefits accruing to USCS.
- **Section 8: ACE External Benefit Analysis—**Contains a summary analysis of benefits accruing to the trade community and society.
- **Section 9: Alternative Comparison**—Contains a comparative analysis of the investment alternatives, examines the risks associated with the alternative, and expresses the results qualitatively and quantitatively.
- **Section 10: Recommendation**—Contains the recommendation and rationale for making an ACE investment decision.
- **Appendix A: Acronym List**—Defines the acronyms used in the document.
- **Appendix B**: **Base Case Infrastructure and Support Costs**—Contains supporting detail for the ACS Infrastructure and National Data Center (NDC).
- **Appendix C: ACE Infrastructure and Support Costs**—Contains supporting detail for the ACE Infrastructure and for the NDC.
- **Appendix D**: **ACE Application Development–Business Complexity Analysis (BCM)**—Contains the methodology, supporting detail, and results of the BCM.

- **Appendix E: ACE Application Development–Parametric Analysis**—Contains the methodology, supporting detail, and results of the Parametric Analysis.

- **Appendix F: ACE Application Development–Function Point Analysis (FPA)**—Contains the methodology, supporting detail, and results of the FPA.

- **Appendix G: ACE Benefits Analysis**—Contains the methodology, supporting detail, and results of the internal and external benefits analysis.

- **Appendix H: Software Engineering Institute Software Estimation (SEI) Checklist**—Contains the SEI checklist for performing a software development estimate.

- **Appendix I: ACE Technical Architecture**—Contains the planned technical architecture for the ACE system.

- **Appendix J: Key Contributors—**Contains summary profiles of key contributors to the analysis.

- **Appendix K: Independent Methodological Assessment—**Contains an independent assessment of the applied methodological approach.

2 Project Vision

2.1 USCS Project Goals

The USCS project goal is to provide a cost-effective and integrated automated IT system to efficiently process goods and merchandise entering the U.S., collect and analyze commercial data, and meet the current and future needs of USCS and of the trade community. As part of achieving this goal, and considering the urgency of current capacity problems, USCS is intensively investigating the feasibility of the ACE system through ongoing requirements analysis, cost estimation efforts, and system benefits assessments. ACE's over-arching goal is to implement the necessary automation support for the redesigned Trade Compliance process and support the USCS mission.[6]

2.2 Relation to USCS's Strategic Plan

The USCS mission is to ensure that all goods and persons entering and exiting the U.S. do so in accordance with all U.S. laws and regulations. USCS relies upon automated IT systems to achieve the following mission objectives:

- Enforcing U.S. laws intended to prevent illegal trade practices;
- Protecting the American public and environment from the introduction of prohibited hazardous and noxious products;
- Assessing and collecting revenues in the form of duties, taxes, and fees on imported merchandise;
- Regulating the movement of persons, carriers, merchandise, and commodities between the U.S. and other nations while facilitating the movement of all legitimate cargo, carriers, travelers, and mail;
- Interdicting narcotics and other contraband; and
- Enforcing certain provisions of the export control laws of the U.S.

2.3 CBA Goals

The CBA goals are to provide USCS with the following:

- A structured, analytical methodology and a solid framework for future incremental analysis;
- A life cycle cost estimate for maintaining the ACS system;

[6] The Automated Commercial Environment (ACE) Business Plan, January 15, 1999, page 2.

- A life cycle cost and benefit estimate for the ACE system;
- Strategic findings from the trade community on the need for an advanced integrated system;
- Information regarding the advantages and disadvantages of each alternative;
- A determination of the economic viability of ACE using standard CBA criteria;
- A sensitivity analysis of key variables to determine their effect upon the CBA results; and
- An independent expert validation of the investment analysis methodology.

3 Methodology and Assumptions

This section defines the methodology used evaluate ACE costs and benefits compared to the ACS base case and also details general assumptions. An independent assessment of the CBA methodology was conducted and the results of this review are provided in Appendix K.

This CBA focuses on estimating the benefits of a legislatively compliant IT system. Many system features are prescribed by the Mod Act, the CFO Act, the Clinger-Cohen Act, and the Government Performance and Results Act. The Mod Act requires, in part, a system which is: (1) uniform and consistent, (2) minimally intrusive upon the normal flow of business activity as practicable, and (3) improves compliance. Furthermore, it promises to enhance USCS's ability to achieve its mission and objectives. The CBA evaluates these ACE benefits against an ACS base case funded to maintain constant functionality and performance.

These complex issues demand a CBA that evaluates the full range of performance impacts of a new system. The ACE alternative is guided by existing legislation. In this sense, the CBA estimates the economic efficiency of implementing the legislative initiatives. This CBA should be viewed as part of a continuing investment analysis program established by USCS. USCS is aggressively engaged in research to continuously update results to support future incremental CBA analyses.

The CBA focuses on the broad resource allocation question of whether the benefits of ACE exceed its development and operating costs. That is, are the benefits associated with the ACE approach to legislative compliance greater than the costs of the investment. The benefits reported in this CBA reflect the improved efficiency and the performance of the new technology. Benefits are categorized as either internal or external. Internal benefits are captured by the USCS in the form of reduced costs and increased revenue recovery. External benefits accrue to the trade community, to society, and to the economy as a whole. Better enforcement, and targeting generates benefits to society through improvements in narcotic interdiction. And, the economy as a whole can benefit through improved monitoring and enforcement provisions of international trade agreements.

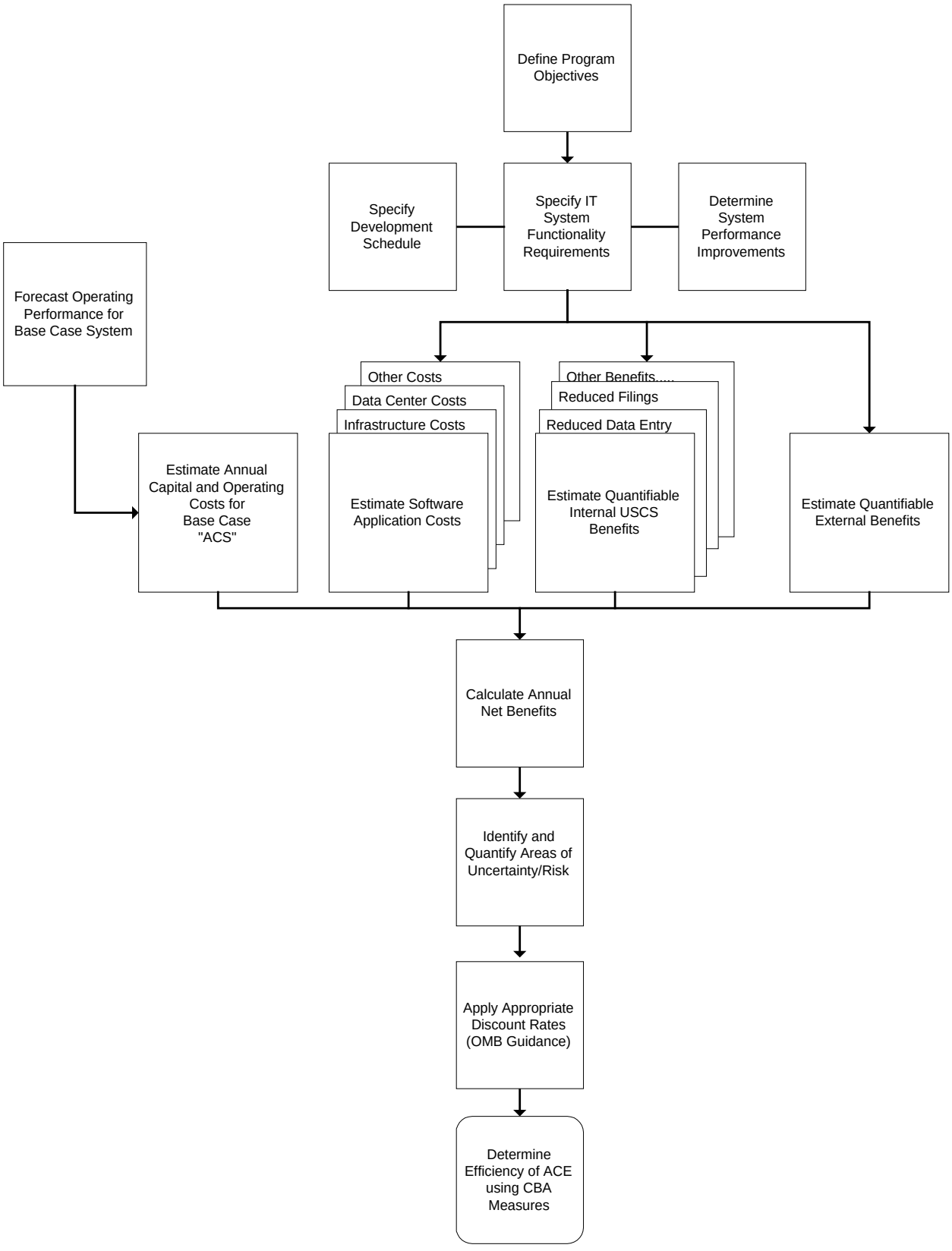
3.1 Methodology

The CBA methodology provides the basis for making an economically sound IT investment decision. Figure 3-1 provides an overview of the CBA methodology and the means by which investment decision criteria are calculated. Sections 5 and 6 provide further details on the ACS and ACE cost calculations respectively. Sections 7 and 8 illustrate the internal and external ACE benefit calculations. The figure highlights a number of key points. First, it is critical to translate the program objectives into specific system functionality. Second, system functionality, combined with a development cycle, must be translated into life cycle costs and measurable system performance impacts. Performance impacts are then translated into benefits, both internal and external.

The CBA consolidates cost and benefit estimates into investment decision criteria. These criteria are standard to public investment analysis and they comport with OMB and USCS guidance.

The key indicator of investment worthiness is net present value (NPV). NPV is the present value of benefits minus the present value of costs. The rate of return (ROR) is the discount rate at which the present value of benefits equals the present value of costs. An NPV of greater than zero and an ROR that exceeds a policy prescribed discount rate indicate worthy public investments. A sensitivity and risk analysis is performed to establish the consequences to the investment decision from changing key input variables.

Figure 3-1: Overview of ACE Cost-Benefit Analysis Methodology



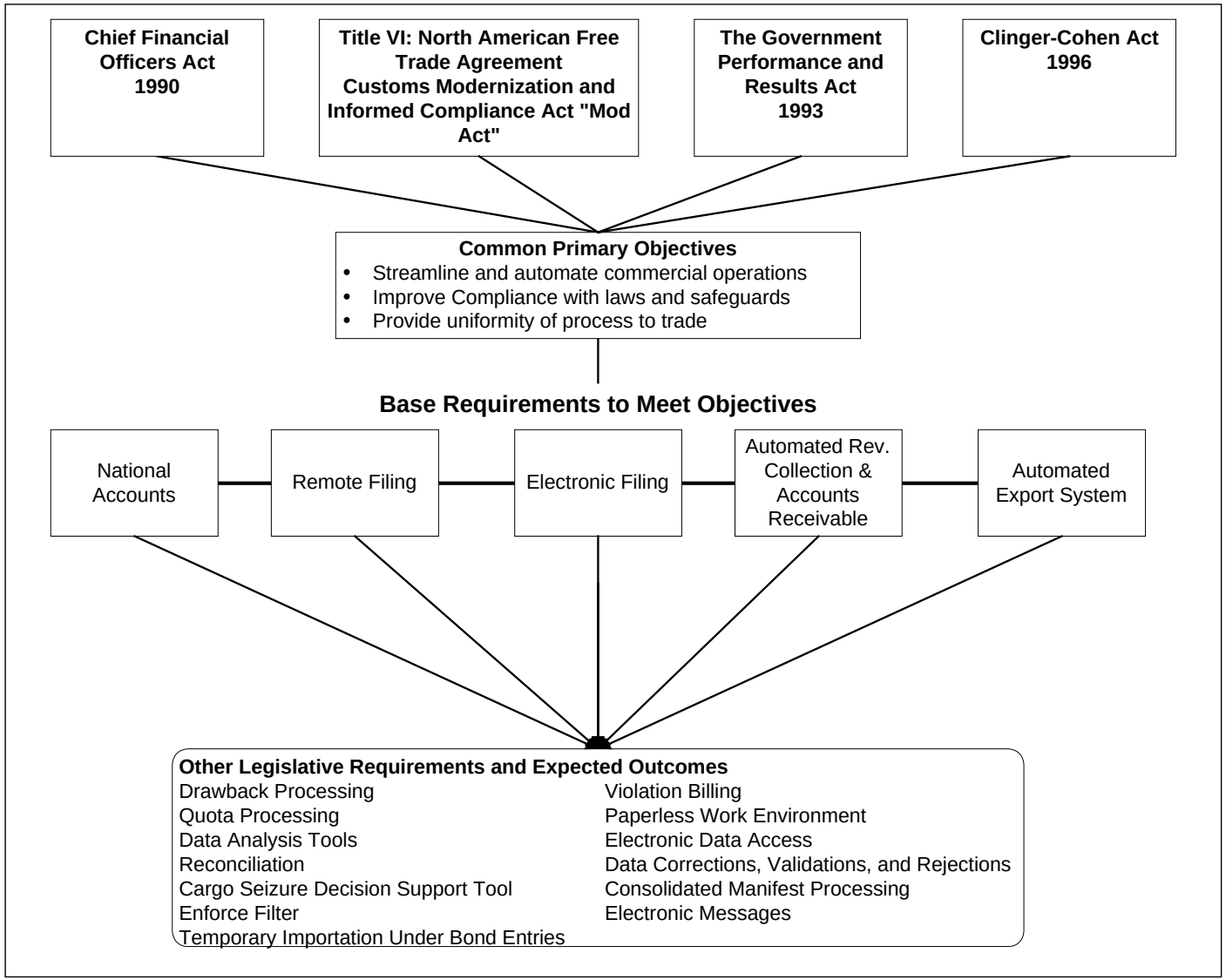
3.1.1 Define Program Objectives and the Base Case

The starting point for a CBA is the exact definition of program objectives and the characterization of the base case and alternative(s). In this case, program objectives relate to the automation and modernization of USCS IT systems as consistent with the Mod Act and other relevant legislation. The following paragraph presents the definition of the base case used in this study.

> *ACS Base Case*—The ACS base case is the current trade management system funded to maintain the existing level of functionality and performance. The base case does not reflect expenditures related to adding functionality or modifications to business processes required by the Mod Act and other relevant legislation. An evaluation of an enhanced ACS base case containing additional functionality is not possible until ACS is further documented and an assessment is conducted to determine what functionality can realistically be added.

To meet legislative requirements and intent, USCS has identified fundamental IT requirements. In some cases, these requirements represent additional technical capabilities to the current system. In other instances, improvements are more fundamental, with the most fundamental being a move from a transaction-based system to an accounts-based structure. Figure 3-2 summarizes the relationships between recent legislative actions and USCS's understanding of the minimum technological and business process requirements needed to address those actions.

Figure 3-2: Overview of Legislative Actions and Relation to USCS Business Processes



Establishing a proper basis for comparing alternative investments is necessary, otherwise a misleading and inappropriate ranking of alternatives may result. The most important distinction is the separation of the base case from the "do nothing case" or status quo. For instance, capital additions, on-going business process improvements, reductions in regulations through free trade agreements, and better utilization of existing technology will continue to improve the productivity of the USCS workforce, even without a major investment. Failure to recognize these ongoing improvements will result in an inappropriate evaluation of alternatives, and likely, an overstatement of benefits.

Similarly, assuming zero cost escalation in the base case biases the results against a new investment. This CBA includes the costs associated with maintaining current functionality at the same processing rate. As such, a significant investment in ACS is required to maintain its current performance. By reflecting these costs, the CBA, in essence, analyzes the benefits of the additional investment in ACE over and above the costs associated with continued ACS operations.

Given that some benefits from ACE stem from increased productivity by optimizing the labor technology mix, the analysis builds a life cycle profile of transaction processing costs in the base case. This profile is based on historical trends in transaction processing productivity, relating entries processed to entry-related USCS staff positions. The key to estimating the worthiness of ACE is defining a base case with the following:

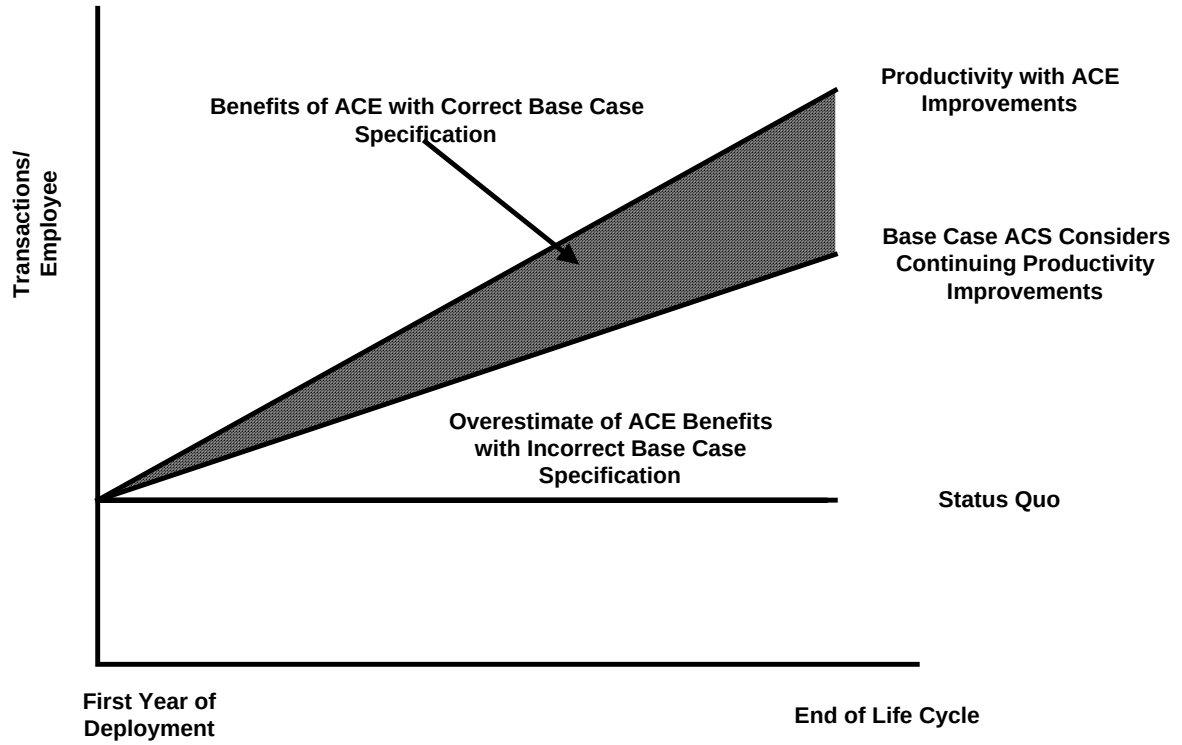
1. Necessary funding to keep ACS operational in the short and long term;

2. Adjustments for on-going productivity improvements due to capital additions; and

3. Estimates that reflect the uncertainty associated with cost and performance estimates.

The above considerations are translated into a base case life cycle cost estimate. Figure 3-3 is a simplified example of the consequences of misrepresenting the base case. The figure shows the productivity relationship of transaction entry processing in terms of transactions per employee. If one assumed the status quo rather than continuing improvements, benefits would be overestimated by the area shown.

Figure 3-3: The Implications of Different Base Case Definitions



3.1.2 Define the ACE Alternative

After defining the base case, the next step is to define the operating characteristics and estimate the costs of the ACE alternative. USCS has defined ACE to meet legislative and supporting business process requirements. This system, in meeting these requirements, generates a series of productivity enhancing effects for both the USCS and the trade community. These productivity gains are not entirely due to improvements in processing speed and reductions in system delays. They are also due to immediate and fundamental improvements in productivity from changing the way in which business is being conducted.

The ACE alternative assumes ACS will continue to operate over the four year deployment period and for an additional two years for contingency purposes. These operating costs are reflected in the ACE alternative. Upon completion of an ACS migration plan, migration costs, including those associated with code disposal, documentation, etc. will be included in subsequent financial analyses. The following paragraph presents the definition of the ACE alternative used in this study.

> *ACE Alternative*—The ACE alternative is a system containing the full functionality as established by legislative requirements and intent. It reflects an overall philosophical and operational shift from service port transaction-based workflow and processing to national/account-based workflow and processing. In meeting these requirements, the alternative generates a series of productivity enhancing benefits that accrue to both USCS and the trade community. These

productivity gains are not entirely due to improvements in processing speed and reductions in system delays. They also are due to immediate and fundamental improvements in productivity from changing the way in which business is conducted.

3.1.3 Calculate Present Value of Life Cycle Costs

Once the base case and the ACE alternative are comprehensively defined, life cycle costs can be estimated and discounted using standard practices. This CBA considers the following cost components:

- *Infrastructure*—These costs are related to router, circuit, personal computer (PC), server installation, and hardware. Non-recurring infrastructure costs are those initial equipment costs associated with setting up a system. Recurring infrastructure costs are based on infrastructure equipment being replaced or "refreshed" according to a set schedule after the initial deployment.

- *Data Center*—These costs are associated with network management, mainframe maintenance, voice communication, database, server operations, system security, government and contractor personnel, and travel and training.

- *Application Development/Software Maintenance*—These non-recurring application development costs are derived from the average of the BCM, a parametric model, and FPA software estimation models. Recurring software maintenance costs are expenditures necessary to maintain the level of functionality throughout the system's life cycle.

3.1.4 Estimate ACE Benefits

The CBA addresses two broad benefits categories, internal and external, as described in Figure 3-1. Internal benefits are those realized by USCS, either in terms of productivity improvements or increased revenues, as a result of improving the performance of IT systems. External benefits flow to the trade community through reduced transaction costs. Many ACE features can be expected to improve the efficiency and effectiveness at which USCS achieves its public mission. Internal and external benefits result from technology's impact on productivity. Several factors determine the scope and magnitude of potential benefits. These include:

- The number of users of the technology (inside and outside the organization) and the activity levels of these users;

- The costs of accessing and using IT systems for processing transactions;[7]

- The extent to which entire business processes can be redesigned thereby generating transaction cost savings; and

[7] In the context of a trade benefits study, this calculation could also include an assessment of the value of goods in transit, particularly for time sensitive shipments.

- The performance impacts of the technology (i.e., change in processing speed).

Where data permits, this study applies four steps to quantify internal and external benefits.[8]

1. *Enumerate the User Base:* Requires the quantification of the total number of users and the classification of these users, whether they are internal or external.

2. *Estimate the Technology Impact:* Requires a technology assessment in quantitative and qualitative terms. Quantitative estimates reflect the average time saved per user or a reduction in direct costs (non-labor) created by the implementation of new technology. New or significantly enhanced IT systems may eliminate entire business processes or significantly reduce intermediaries in the value chain, thereby reducing transaction costs.

3. *Estimate Direct Benefits:* Translates the technology into monetized direct benefits using forecasts of wage rates and other direct unit costs.

4. *Project Timing of Direct Benefits:* Assigns the flows of benefits to specific years of the evaluation over the useful life of the investment. This assignment is based on the expected penetration of the technology into USCS business processes.

3.1.5 Calculate Cost-Benefit Analysis Ranking Measures

Standard CBA criteria ensure the consistent evaluation and ranking of alternative investments. Table 3-1 summarizes standard CBA measures used to rank projects within an investment portfolio or across a range of portfolios with different objectives. They assess the economic feasibility of an alternative against a well-specified base case.

Also included in the table is a measure of timing that determines the period within which an investment's costs are recovered. It is important to note that these measures may identify projects that are marginal and may be worthy of further consideration. These measures also provide an indication of an investment's risk. The longer the payback period, the longer the positive result relies on long-term forecasts of system performance. The CBA reflects long-term uncertainty in assumptions by expanding the range for input values and using conservative assumptions.

[8] A comprehensive estimation of trade benefits would require data in all four areas which, in most cases, is proprietary competitive information for each member of the trade community. This both limits the amount of quantification that can take place but calls for explicit treatment of uncertainty where secondary sources are used.

Table 3-1: Standard Cost Benefit Evaluation and Ranking Measures

EVALUATION MEASURES	
MEASURES OF VALUE	
Net Present Value (NPV)	Present value of benefits minus present value of costs. A NPV greater than zero indicates a project is economically efficient. Projects can be ranked according to NPV.
Rate of Return (ROR) *Internal Rate of Return (IRR)*	The discount rate at which the stream of net benefits equals zero. If the rate of return exceeds the discount rate set by public policy, the investment qualifies for consideration.
Benefit-Cost Ratio (BCR)	Present value of benefits divided by the present value of costs. A ratio of greater than one indicates the project is worthwhile.
MEASURES OF TIMING	
Payback Period	Number of years until capital is recovered through the flow of benefits. A short payback period reflects less funding risk.

3.1.6 Perform Sensitivity and Risk Analysis

This CBA characterizes the nature and quantifies the sources of uncertainty surrounding input assumptions. In particular, the study provides probability ranges for key input assumptions and probabilistic representations for key outputs, including life cycle costs. Risk analysis is a technique that systematically addresses the underlying uncertainty or variability in model inputs. Once this uncertainty is represented, simulation techniques are used to generate probability distributions for outputs. This allows decision makers to make judgements on a risk-adjusted basis. The following steps define the risk analysis process:

- *Determine the primary input variable drivers*—Use tornado charts in conjunction with sensitivity charts to establish the primary benefit drivers.

- *Develop appropriate distributions and input ranges*—Distribution and range decisions will be based on quantitatively and qualitatively assessing a number of factors including:

  - *Cost inputs*: Technology, configuration, supportability, programmatic, and management.

  - *Benefits drivers*: The underlying uncertainty of an input value as reflected by historical trends, the nature of the variability of an input value, the robustness of historical data, and the institutional barriers to changing business processes.

- *Simulation*—Once the procedure of assigning a probability distribution is completed for each input, a Monte-Carlo simulation is run.

- *Generate relevant graphs and tables*—Prepare risk-weighted mean estimates are presented in graphical and tabular form.

3.2 General Assumptions

The following general assumptions are made in this analysis. Specific assumptions or methods related to specific benefit or cost calculations are included in the appropriate section or appendix.

- *Period of Analysis*—The period of analysis encompasses FY 2000 through FY 2021. The four-year ACE development is evaluated with an 18-year operation and maintenance period.

- *Data Collection Period*—Financial and performance data were collected between third quarter 1998 and first quarter 1999.[9] Data sources included USCS subject matter experts, industry standards, and corporate knowledge.

- *Procurement Award*—The ACE contract award date is January 1, 2000. Note that during the course of this analysis, the future of ACE funding became increasingly uncertain. Given this uncertainty, no attempts were made to adjust the assumptions underlying this analysis. Changing the award date does not materially alter this study's conclusions.

- *ACE Scope*—The functional groups within the scope of this analysis are those defined in the ACE Functional Grouping Chart provided by USCS.

- *ACE Application development*—Application development occurs at government leased and equipped facilities.

- *System Development Approach*—The USCS will procure a Software Engineering Institute (SEI) Capability Maturity Model (CMM) Level III Development Contractor to develop the ACE application. USCS will utilize a Federally funded Research and Development Center (FFRDC) to provide independent guidance in acquiring and managing the prime contractor.

- *Trade Volume Growth Rate*—Based on the trend of the past 13 years, the trade volume growth rate will increase 8.28% per annum.

- *Sunk Costs*—The $65.3 million expensed and obligated to date (beginning of FY 1995 through FY 2000) is treated as a sunk cost and is excluded from the estimate.[10]

- *Discount Rate*—Per OMB Circular A-94 guidance a 7% discount rate is applied.

[9] Quarters are based on calendar year.

[10] This estimate is provided by USCS. The costs include $43 million to implement the first two phases of the National Customs Automation Program Prototype (NCAP/P), $9.5 million on joint ACS and ACE infrastructure, $6.5 million on the ACE Data Warehouse and Trend Analysis and Analytical Selectivity Program, $5 million to complete the business process re-engineering of the trade programs, $1.2 million on contract support of the International Trade Data System (ITDS) initiative, and $400,000 to support the Customs Distributed Computing (CDC-2000) initiative.

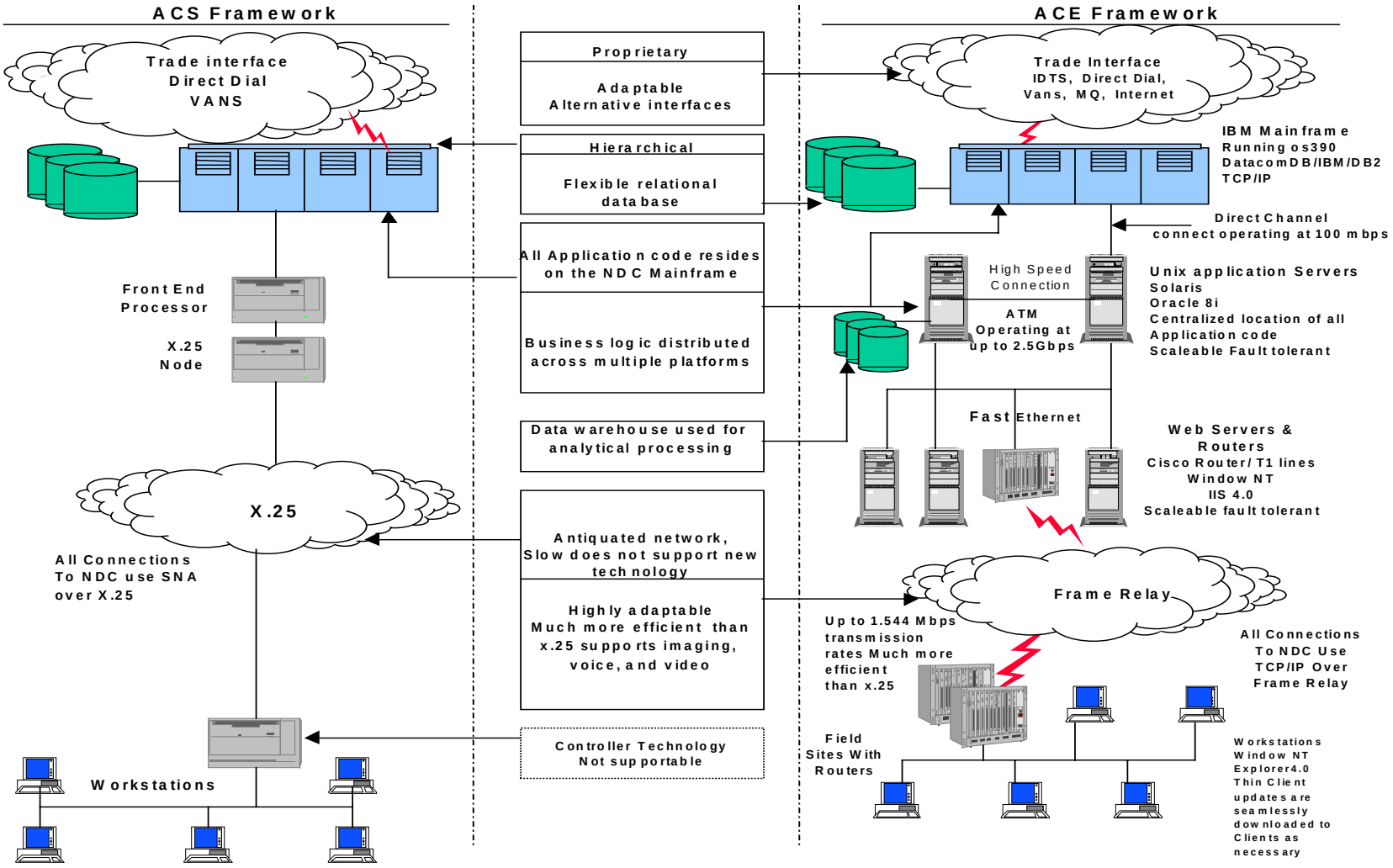
4 Alternative Descriptions

This section examines the principal technical difference between ACE and ACS. ACE, as currently planned, utilizes a multi-tiered architecture where there is a processor for on-line transaction processing, another for ad hoc database queries, and an open communication platform (TCP/IP over frame relay) to connect varying hardware to one system.

ACS's system architecture is a mainframe-based architecture for on-line and batch processing. Queries must run on the same processor as the on-line portion of the system. Additionally, the network platform (X.25 protocol over SNA) imposes some interoperability constraints on the system.

Figure 4-1 compares the ACS technical architecture to the envisioned ACE architecture. The ACE technical configuration could change based upon alternative design proposals. The existing *ACE Technical Architecture* is contained in Appendix I. The following figure forms the basis for the ensuing ACS and ACE system descriptions.

Figure 4-1: System Architecture Overview



4.1 ACS System Description

ACS is an extremely large and complex transaction-based, legacy processing system. It is a service port-specific system, which was designed and developed with the goal of automating manual processes. The system, while allowing electronic filing, still requires duplicate electronic entry of forms by both USCS and the importer. There are three primary ACS users: the trade community (i.e., private or commercial companies importing goods to the U.S.), USCS employees, and other government agencies. The trade community primarily communicates with ACS through the ABI. The ABI is a proprietary EDI process that provides the gateway for the trade community to communicate with ACS.[11] Internal USCS users do not require any proprietary interface mechanism for access.

One primary ACS function is to track, control, and process all commercial goods imported into the U.S. The system has been operational since 1984 and performs transactional and analytical processing. The transaction processing is high-volume, real-time processing that directly supports the life cycle of an entry from transmission through inspection, verification, and eventual liquidation. The analytical processing is based on large quantities of historical data that users search and query, using a variety of software tools, identifying compliance trends and targeting entries or entry summaries. The targeting criteria are used to automate work, presenting USCS with more opportunities to focus on non-compliance. With ACS, the same hardware and software environment is used for both transaction and analytical processing.

4.1.1 ACS Technical Description

During the data collection period ACS employed International Business Machines' (IBM) Multiple Virtual Storage (MVS) operating system mainframe with two IBM-provided job entry subsystems (JES2). The database is Datacom, with Common Business Oriented Language (COBOL) programming language. The ACS system uses Customer Information Control System (CICS) middleware provided by IBM and Multi-Tasking System (MTS) middleware developed by USCS. The system currently processes over one million transactions per day and handles over five hundred thousand database requests per day. The system at times operates at over 90% capacity and has recently experienced several instances of downtime and reduced performance where transaction processing requirements were exceeded. Should an extended service outage (i.e., more than four hours anticipated duration) occur, the back up procedure is manual processing. This labor-intensive alternative does not accommodate reporting requirements. In addition, since this alternative does not include any auditing capabilities, an expensive manual review would have to be performed.

Since 1984, ACS has become increasingly complex. Through the use of EDI, ACS has made major advances toward reducing paperwork requirements for both USCS and the trade community. The ABI has been instrumental in accomplishing paperless entry summary processing, granting accelerated clearance of designated shipments, providing access to USCS reference files, and paying duties via wire transfers. Over its 15-year existence, ACS has

[11] *ACE Technical Architecture*, U.S. Customs, October 30, 1998.

become increasingly integrated, interacting with trade participants and other government agencies. In spite of these advances and upgrades, new demands put on ACS by legislative requirements and the need to handle increasing processing capacity demands will tax the capacity and capabilities of the current system.

4.1.2 FY 1999 ACS System Enhancements

Subsequent to the data collection period spanning the fourth quarter of 1998 and the first quarter of 1999,[12] several system enhancements have occurred. Because these enhancements occurred outside the data collection period they are not reflected in this investment analysis. The effect would be to decrease some ACS life cycle costs. Therefore, financial analyses conducted between November 1998 to date draw from the same data pool and rely upon the same general investment and technical assumptions. The principal technical enhancements made since the data collection period are:

- Replacement of the IBM model 9021-9X2 mainframe with an IBM model 9672-Y76. The new mainframe is configured with seven central processing units (CPUs), two gigabytes (GB) of central, and six GB of expansion memory. This configuration has a maximum capacity of 841 million instructions per second (MIPS). It can be further expanded to a total of up to 10 CPUs and 16 GB expanded memory in the existing cabinet (providing a capacity of 1,068 MIPS). Additional cabinets can be acquired as well, providing the potential for a significant number of additional processors and memory. It is expected that capacity can be increased by replacing the existing CPUs with later generations, without changing the number of installed units.

- The JES2 input/output (I/O) subsystems have been replaced with newer, more capable technology. This provides for much faster throughput and an increased ability to queue jobs during periods of peak system activity.

- All non-RAID (redundant array of inexpensive disk) compliant direct access storage device (DASD) is scheduled for replacement by the end of FY 1999. RAID storage is significantly more expandable and scalable than other forms. Hence, the DASD capacity of the system should be able to keep pace with the anticipated growth in size of the database.

These specific enhancements, by increasing scalability, enable the further expansion of the system to accommodate transaction volume growth. While neither these specific system enhancements nor any specific follow-on enhancements are included in the investment analysis, the need for hardware expansion is addressed by incorporating a compounded 15% per year factor accounting for the cost to maintain constant processing performance.[13] It is assumed that this growth allowance accounts for all system enhancements required to maintain current

[12] Quarters are based on calendar year.
[13] This assumption is based upon a study conducted by the Gartner Group: *Assessment of the Automated Commercial System (ACS)*, January 14, 1998.

performance levels and to fully accommodate transaction growth. Similarly, rising Computer Associates (CA) software licensing costs are reflected in the hardware growth projection.

4.2 ACE System Description

Many ACE business process improvements reflect an overall philosophical and operational shift from service port, transaction-based workflow and processing to national, account-based workflow and processing. The ACE goal is to provide the automation support needed to implement fully redesigned business processes. The need for ACE as a replacement for ACS developed from two primary factors:

- The business of the USCS commercial processing has greatly evolved since ACS was originally created. The need to reengineer business processes to improve efficiency, meet federal guidelines and legislative mandates, and reduce cost has become compelling.

- Making needed enhancements to the ACS application software is becoming increasingly more difficult and expensive due to an aging legacy system that is not easily expandable or compatible with new technology.

The proposed ACE system will support over 40 service ports[14] (automobile, truck, air, sea, and rail) and 907 sites[15] geographically located across the U.S. and U.S. territories, and will process one million account-based transactions each day with the ability to increase the capacity by utilizing the scalability of the system. The system will support an estimated 15,000 users and will provide approximately 2,000[16] members of the trade community access to data 24 hours a day, 7 days a week.

ACE will allow remote filing of shipping manifests and electronic processing of financial transactions. The ACE program will support the life cycle of an entry from initial transmission though final liquidation. ACE provides the following functionality, which is either unsupported or only partially supported by ACS:

- Remote Filing;
- Periodic Statements;
- Periodic Payments;
- Reduced Data Entry;
- Reconciliation;

[14] A service port is a geographical service area composed of a grouping of ports (subports) under the jurisdiction of a single port (e.g., the service port of Detroit consists of the cities of Detroit, Port Huron, Battle Creek, Grand Rapids, Marine City, Pontiac, and Sault St. Marie.

[15] A site in a service port can have different functions and locations (e.g., port offices, tunnels, dock buildings, airports, and ferry terminals).

[16] The Automated Commercial Environment (ACE) Business Plan, U.S. Customs Service, January 15, 1999.

- Streamlined Automated Manifests;
- National Account Management; and
- Streamlined Billing, Collections, Refunds, Quota/Duty Filings.

4.2.1 ACE Technical Description

The ACE system is designed as a high-volume, account-based processing system that is national in scope and provides import processing support, security clearance, fee assessment and collection, and trade information that is critical to the U.S. Government. To achieve this goal, ACE provides transaction and analytical processing. These two types of processing place different demands on the processing equipment. The envisioned transaction processing environment will occur centrally on an IBM MVS platform running CICS with Database 2 (DB2). The analytical processing will be distributed across the NDC. Transactional and analytical processing will be accessible via a single Windows Graphical User Interface (GUI), which will make the implementation specifics of the particular processing locations and platforms transparent to the user.

The processing and size of the application-specific executables on the desktop machines will be minimized through the use of multi-tiered application and database servers. The application tiers may be distributed across the local Windows NT servers, the centralized Solaris servers, and the centralized IBM mainframe. The local Windows NT servers will communicate with the NDC through the Treasury Communication System (TCS) Wide Area Network (WAN) consisting of multiple T-1 lines using Transmission Control Protocol/Internet Protocol (TCP/IP) on an Asynchronous Transfer Mode (ATM) backbone.

The IBM mainframe will provide capacity of at least one terabyte of on-line storage. In addition, the NDC will maintain redundant mainframes with redundant disks, power supply, and controllers to provide "fail-over" capability to the surviving mainframe.

The ACE model is a distributed multi-tiered architecture with three levels of partitioning: presentation, application, and data. The tiers are platform independent and provide for the requirement of connectivity to the USCS legacy systems. The system is distributed in the sense that real-time access and data interaction is provided down to the ports while application processing and data security, including encryption, is performed in the secured environment of the NDC. Application is further delineated by the use of both server and mainframe technologies to process and store data.[17]

On May 4, 1998, the first release of ACE occurred in the ports of Laredo, Detroit, and Port Huron. Known as the National Customs Automation Program/Prototype (NCAP/P), this release successfully demonstrated an ACE-supported, redesigned trade compliance business process. GM, Ford, and Chrysler, the three prototype participants, have received release of cargo using a fully electronic process requiring minimal data elements since its inception. During the

[17] ACE Technical Architecture; U.S. Customs Service; October 30, 1998.

prototypes first seven months, an average of 1,262 trucks arrived per month with an average of 1,595 entries per month. During the next six months, an average of 2,638 trucks per month arrived resulting in an average of 7,677 entries per month. Robert Bosch, another prototype participant will soon begin using the system. The second release of NCAP/P, encompassing cargo release plus a fully electronic examination process, was implemented in the three original prototype ports on October 10, 1998. The third and fourth NCAP/P releases may be implemented as part of the Prime Contractors efforts. This early evidence shows that ACE is a viable and successful technical alternative to the current system.

5 ACS Cost Analysis

This section defines the cost profile of the ACS base case to which the ACE alternative's costs and benefits are compared. The base case is defined as the existing legacy system funded to maintain the existing level of functionality and performance. The section describes ACS specific assumptions, the advantages and disadvantages of the base case and then summarizes the non-recurring and recurring cost components.

5.1 Assumptions

The principal assumptions are:

- The ACS software maintenance estimate was developed using input from USCS provided ACS software maintenance data.
- The base case assumes no additional functionality or changes in performance.
- Data center infrastructure costs increase at a 15% compounded rate per annum to reflect capacity upgrades. Adding capacity to the system in order to accommodate volume growth is the more desirable and realistic manner to portray costs. Limiting capacity and absorbing growing downtime costs is not acceptable for a mission critical system. While some downtimes/outages currently occur, these are generally either too short to materially impact the ports or are driven by factors common to both the ACS and ACE investment scenarios. Therefore, this analysis reflects the cost of adding processing and storage capacity, in order to prevent downtime, but does not reflect any costs associated with downtimes. For background information, a down time cost analysis is included in Appendix B.
- Data Center infrastructure upgrades result in no significant ACS downtime.
- As the ACS system is largely undocumented, a two-year documentation effort will begin FY 2003.
- Infrastructure equipment is replaced every four years after a port has received upgraded equipment.

5.2 ACS Advantages and Disadvantages

As summarized in the following table, the majority of ACS business and technical advantages are those typically associated with a legacy system where the initial development, training and design investments results in predictable support activities. With high user familiarity, refined training programs, and a comparatively flat learning curve as the software and hardware technology is locked in, ACS offers these advantages over any new system. However, those same advantages become disadvantages as the system ages. Future enhancements will become resource intensive since over 1,000 databases and 6,000,000 lines of code have not been fully documented.

In addition:

- Hardware/Software supporting ACS is antiquated.
- ACS relies on a limited hierarchical database structure.
- ACS does not fully support analytical processing.
- ACS cannot leverage off new technologies.
- The skills required to support ACS are part of a declining labor pool.

Table 5-1: ACS Advantages and Disadvantages[18]

Requirements	Advantages	Disadvantages
Business	High trade participation and familiarity	Questionable if full compliance with legislative requirements would be reached
		Business processes that are currently manual (paper) would remain manual resulting in lost cost saving opportunities
	Low training costs for Customs and Trade	Redundant keying of data will be required because existing database modules are not linked, which increases potential non-compliance and prevents potential cost efficiencies
		"Mod Act" requirements are not met
		Does not fully support transition from transaction-based to account-based processing
		Continued port uniformity issues
		Inability to provide better status and mgmt reports to the trade
Technical	Current system is fully developed and deployed	Requires difficult and expensive survival maintenance; i.e. aging technology and increasingly unavailable technical support expertise.
	Potential for faster deployment than ACE	Technical structure makes it difficult and expensive to implement improvements/enhancements
	Basic hardware infrastructure is already in place	Continued expansion of functionality endangers operating capability and increases system capacity failure risk
	Good corporate knowledge of system functionality exists among development staff and trade users	ACS not sufficiently documented for such extensive modification, and would require additional time and funds to complete documentation process
		ACS system based on antiquated data management principles
		Requires complete redesign of port and security modules to accommodate account-based processing
		Current architecture will not scale to meet estimated growth demands

5.3 Recurring and Non-Recurring Costs

The following table summarizes projected annual expenditures for the base case system. Expenses are categorized as either non-recurring or recurring items. The "Appendix" column identifies the appendix containing supporting detail. Note these values are not risk-adjusted and should not be used for capital budgeting purposes.

[18] *The Automated Commercial Environment, Business Plan*, January 15, 1999.

Table 5-2: ACS Estimate (Constant Year Million $--Not Risk Adjusted)[19]

Non-Recurring FY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	App.
Infrastructure	29.5	10.4	3.0	20.1	34.9	30.6	25.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**153.9**	**B**
Data Center	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**B**
Software Maintenance	0.0	0.0	0.0	4.1	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**8.2**	
Subtotal	**29.5**	**10.4**	**3.0**	**24.2**	**39.0**	**30.6**	**25.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**162.1**	

Recurring FY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	App.
Infrastructure	9.5	10.4	10.9	12.6	36.2	24.5	26.7	32.4	64.3	46.3	37.1	32.4	64.3	46.3	37.1	32.4	64.3	46.3	37.1	32.4	64.3	46.3	**814.3**	**B**
Data Center	42.4	46.3	52.3	54.3	53.3	56.0	57.2	58.5	59.8	60.2	61.2	62.4	63.2	64.6	66.2	68.1	69.8	72.1	74.9	78.2	81.6	85.8	**1,388.4**	**B**
Software Maintenance	4.0	4.2	4.4	4.6	4.9	5.1	5.4	5.6	5.9	6.2	6.5	6.8	7.2	7.5	7.9	8.3	8.7	9.2	9.6	10.1	10.6	11.1	**154.0**	
Subtotal	**55.9**	**60.9**	**67.6**	**71.5**	**94.4**	**85.6**	**89.2**	**96.5**	**129.9**	**112.7**	**104.8**	**101.7**	**134.7**	**118.5**	**111.2**	**108.8**	**142.8**	**127.6**	**121.7**	**120.8**	**156.4**	**143.2**	**2,356.7**	

Total FY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	App.
Infrastructure	39.1	20.9	13.9	32.7	71.2	55.2	51.9	32.4	64.3	46.3	37.1	32.4	64.3	46.3	37.1	32.4	64.3	46.3	37.1	32.4	64.3	46.3	**968.2**	**B**
Data Center	42.4	46.3	52.3	54.3	53.3	56.0	57.2	58.5	59.8	60.2	61.2	62.4	63.2	64.6	66.2	68.1	69.8	72.1	74.9	78.2	81.6	85.8	**1,388.4**	**B**
Software Maintenance	4.0	4.2	4.4	8.7	9.0	5.1	5.4	5.6	5.9	6.2	6.5	6.8	7.2	7.5	7.9	8.3	8.7	9.2	9.6	10.1	10.6	11.1	**162.2**	
Total	**85.4**	**71.3**	**70.7**	**95.7**	**133.5**	**116.2**	**114.5**	**96.5**	**129.9**	**112.7**	**104.8**	**101.7**	**134.7**	**118.5**	**111.2**	**108.8**	**142.8**	**127.6**	**121.7**	**120.8**	**156.4**	**143.2**	**2,518.8**	

[19] Totals may not sum exactly due to rounding effects.

5.3 ACS Base Case System Costs

The costs presented in this section document the expenses associated with maintaining current ACS functionality and performance. The recurring and non-recurring cost components include:

- Infrastructure;
- Data Center; and
- Software Maintenance.

5.4 Non-Recurring Base Case Costs

5.4.1 Infrastructure

Non-recurring infrastructure costs are those costs associated with establishing the ACS-related equipment at service ports processing commercial cargo. These expenditures are related to router, circuit, personal computer (PC), server installation, and hardware. The infrastructure provides connectivity from USCS headquarters to regional sites and ports.

5.4.2 Data Center

Data center costs are treated as recurring costs. The difference between the base case data center estimate and the ACE alternative is attributable to differences between the ACS and ACE technical architecture. The ACE data center estimate includes ACS life support and costs associated with UNIX servers and UNIX maintenance.

5.4.3 Software Maintenance

To fully comply with Treasury Information Systems Architecture Framework (TISAF) requirements, the ACS system must be fully documented. A 1997 analysis estimated this effort to entail 96,000 hours of contractor time.[20] The applied contractor rate of $83.00 per hour resulted in an estimate of $7,968,000. For this analysis, the contractor rate has been updated to $86.00 an hour reflecting the hourly rate for a system's analyst and senior programmer as consistent with the GSA rates applied elsewhere in this study. The updated total of $8,256,000 is applied equally over FY 2003 and FY 2004.

[20] *Cost Benefit Comparison (CBC): Automated Commercial Environment (ACE) vs. Automated Commercial System (ACS) FY 1998 to FY 2007;* United States Customs Service; December 4, 1997.

5.6 Recurring Base Case Costs

5.6.1 Infrastructure

Recurring infrastructure costs are those costs associated with replacing ACS-related equipment which provide connectivity between service ports and Customs Management Centers (CMC). These expenditures are related to router, circuit, PC and server installation, and hardware.

Recurring infrastructure costs are driven by a port-by-port deployment schedule identifying when each locale is slated to receive equipment upgrades. These costs reflect a rolling, four-year replacement cycle for PCs and servers. After the initial deployment, infrastructure is assumed to be replaced at a constant rate throughout the remainder of the life cycle. As such, the initial installation is treated as a non-recurring cost and subsequent upgrades are treated as recurring costs. Circuit costs include the Executive Treasury Agent Fee assessed for carrying network traffic. (Refer to Appendix B for additional detail.)

5.6.2 Data Center

Data center estimates are based on projections and interviews from USCS/ISD subject matters. Cost elements include network management, mainframe maintenance, voice communication, database, server operations, system security, government and contractor personnel, and travel and training. (Appendix B also contains data center cost estimate detail.)

Adding capacity to the system in order to accommodate volume growth is the desirable and realistic manner to portray costs. Limiting capacity and absorbing growing downtime costs is not acceptable for a mission critical system. While some downtimes/outages currently occur, these are generally either too short to materially impact the ports or are driven by factors common to both the ACS and ACE investment scenarios. Therefore, this analysis reflects the cost of adding CPU and storage capacity, in order to prevent downtime, but does not reflect any costs associated with downtimes. A down time cost analysis is included in Appendix B. To maintain constant performance, in lieu of rising transaction growth, data center infrastructure costs are assumed to increase at a compounded rate of 15% per annum.[21]

5.6.3 Software Maintenance

ACS software maintenance costs are based upon historic USCS data. These expenditures are expected to allow the system to operate at its current level of functionality throughout the system's life cycle. Code maintenance, estimated to be $4 million per year, includes adaptive, corrective, and preventive maintenance activities.

Software maintenance costs are anticipated to grow 5% annually on a compounded basis as new code is added over time. Note this value is less than the code growth factors utilized in the ACE

[21] This assumption is based upon a study conducted by the Gartner Group: *Assessment of the Automated Commercial System (ACS)*, January 14, 1998.

software estimates. As the base case definition assumes constant functionality, less code expansion will be experienced in a mature system than in a new system.

6 ACE Cost Analysis

This section summarizes the methodology and assumptions used in developing the ACE cost projection with particular emphasis given to the software cost estimation process. The analysis is augmented by a discussion of ACE's comparative business and technical advantages and disadvantages. Concluding the section is a line item review of the cost estimate. Relevant appendices containing supporting detail are referenced throughout.

6.1 Methodology

Building the ACE system estimate required an evaluation of three separate cost components: application development (and maintenance), infrastructure, and data center. Of the three, the application development estimate harbors the greatest potential for estimation risk. The number and timing of the application's functional groups are by necessity fluid, and the functional definition of each group exists only at a high level.[22] Thus, the basis to establish an estimate cannot rely solely upon internal USCS developmental history. The estimation methodology must also incorporate external experience and standards from other developmental efforts. Unlike the application development cost category, the infrastructure and data center estimates contain less uncertainty and are developed using historical USCS data.

To minimize the application estimation error, three separate application development models were considered and their results averaged. These models are a:

- Business Complexity Model (BCM);
- Parametric Analysis; and
- Function Point Analysis (FPA).

The first model, the BCM, builds upon a prior USCS-developed model. The model reflects prior NCAP 0.2 development experience with a comparative size estimate established for each functional group.[23] The second model—a Parametric Analysis—draws conclusions from existing systems similar in size, scope, and functionality to ACE. The third model—the FPA—is driven by a count of the number of defined function points and industry standards to achieve a specified functionality. The average of these three estimates results in the application development cost estimate. Infrastructure and data center costs are added to this estimate. A performance and management risk premium is assessed in Section 9.

The estimates for all three cost categories—application development, data center, and infrastructure—are shown in the following tables. Financial data for the relevant cost categories was collected between third quarter 1998 and first quarter 1999. Data sources included USCS representatives, industry standards, and corporate knowledge.

[22] See ACE Functional Groups, November 3, 1998 and Appendix J: ACE Technical Architecture, page J-49.
[23] Ibid.

6.2 Assumptions

The following assumptions apply to the ACE cost analysis:

- Infrastructure deployment will occur incrementally over four years (FY 2000 through FY 2003) to all ports processing commercial cargo imports.
- Infrastructure equipment is refreshed/replaced every four years after a port has received upgraded equipment.
- Application development occurs off site at government provided and equipped facilities.
- USCS will procure a Software Engineering Institute (SEI) Capability Maturity Model (CMM) Level III Development Contractor to develop the ACE application. USCS will utilize a Federally Funded Research and Development Center (FFRDC) to provide independent guidance in acquiring and managing the prime contractor.
- The ITDS is funded for two years beginning FY 2000.
- ACS will remain operational for two years after ACE is implemented for contingency purposes.

6.3 ACE Advantages and Disadvantages

The proposed ACE system offers significant technical and business advantages over the legacy ACS system. Beyond complying with the Mod and other relevant legislation, the ACE system:

- Increases flexibility and enables “plug & play”;
  - Provides imaging, transponder, biometric, and internet capability;
  - Faster, more sophisticated tools for processing information;
- Improves interfaces with the trade community and other government agencies;
  - Shares enforcement data and statistics in advance resulting in more timely, secure and improved targeting capabilities;
  - Provides a more reliable trade interface resulting in a faster exchange of trade data;
- Increases productivity allowing faster information processing;
  - Ensures accurate, timely data transmission resulting from state-of-the-art network, database, desktop environment, and data center;
- Improves analytical capabilities;
  - Built to handle larger volumes of data which can reach field units more quickly;

  - Enables advanced targeting to stay ahead of growing trade volume;

- Supports new, enhanced business requirements;

  - Foundation based upon strategic direction, business and technology; and

- Reduces costs by applying industry standard, broad, competitive vendor support contracts.

The following table summarizes the principal ACE business and technical advantages relative to the 15-year old ACS system.

Figure 6-1: Business and Technical Advantages and Disadvantages of ACE[24]

ACE	Advantages	Disadvantages
Business	Complete support of Mod Act requirements	Requires a culture change for both USCS and the Trade
	Internal and external stakeholder involvement in development	Participation in the implementation of new automated business processes is not immediate. It is tied to the deployment of computer infrastructure
	Maximum analytical and data management capabilities available	External stakeholders may need to expend resources to align their business processes with the new business functionality
	Highest level of customer service provided	
	Positions Customs to move to the next evolution of system development standards, allowing global interfaces with other countries and international entities	
	Ability to merge with AES to form a single integrated import/export system	
Technical	Internal databases linked, no redundant requests for additional data	Longer overall deployment schedule
	Provides the most modern technical platform for future system enhancements, maintenance, and future business process redesigns	Additional training required for users
	Transaction-intensive processing will run on mainframes while analytical processing will run on client/server platform	Requires the development of corporate knowledge for maintenance and future system upgrades
	A single, integrated Customs-wide database, removing artificial barriers to data access	
	Ability to provide nationwide service from one central location	
	Internal and external users will have the capability to receive real-time, near-real-time and batch access to a much broader array of account information	

[24] The Automated Commercial Environment (ACE) Business Plan, January 15, 1999.

6.4 ACE Cost Analysis

Table 6-1 portrays ACE non-recurring and recurring costs. For both non-recurring and recurring categories, three cost elements are shown: infrastructure, data center, and application development. The "Appendix" column references the respective appendix containing supporting detail. These values are not risk-adjusted and should not be used for capital budgeting purposes.

6.4.1 Non-Recurring and Recurring ACE Estimate

Table 6-1: ACE Estimate (Constant Year Million $—Not Risk Adjusted) [25]

Non-Recurring FY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	App.
Infrastructure	61.1	36.5	38.0	22.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**158.4**	**C**
Data Center	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**C**
Application Development	121.1	153.9	139.6	128.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**543.1**	**D,E,F**
Subtotal	**182.2**	**190.3**	**177.6**	**151.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**701.5**	

Recurring FY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	App.
Infrastructure	11.7	14.8	17.8	19.8	62.7	44.1	44.5	34.1	62.7	44.1	44.5	34.1	62.7	44.1	44.5	34.1	62.7	44.1	44.5	34.1	62.7	44.1	**912.5**	**C**
Data Center	51.0	53.4	56.9	58.6	62.7	70.3	72.0	61.1	62.9	64.4	64.0	65.8	68.2	70.7	71.3	74.2	78.0	82.2	84.6	89.7	96.1	103.2	**1,561.4**	**C**
Application Development	0.0	0.0	0.0	0.0	16.3	11.8	10.2	9.7	9.2	8.7	8.4	8.2	8.0	7.9	7.8	7.7	7.6	7.5	7.5	7.4	7.4	7.3	**158.5**	**D,E,F**
Subtotal	**62.8**	**68.3**	**74.7**	**78.4**	**141.7**	**126.2**	**126.6**	**105.0**	**134.8**	**117.3**	**116.8**	**108.1**	**138.9**	**122.7**	**123.5**	**116.0**	**148.3**	**133.8**	**136.5**	**131.3**	**166.2**	**154.7**	**2,632.5**	

Total FY	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	App.
Infrastructure	72.9	51.3	55.7	42.6	62.7	44.1	44.5	34.1	62.7	44.1	44.5	34.1	62.7	44.1	44.5	34.1	62.7	44.1	44.5	34.1	62.7	44.1	**1,070.9**	**C**
Data Center	51.0	53.4	56.9	58.6	62.7	70.3	72.0	61.1	62.9	64.4	64.0	65.8	68.2	70.7	71.3	74.2	78.0	82.2	84.6	89.7	96.1	103.2	**1,561.4**	**C**
Application Development	121.1	153.9	139.6	128.5	16.3	11.8	10.2	9.7	9.2	8.7	8.4	8.2	8.0	7.9	7.8	7.7	7.6	7.5	7.5	7.4	7.4	7.3	**701.6**	**D,E,F**
Total	**245.0**	**258.6**	**252.2**	**229.8**	**141.7**	**126.2**	**126.6**	**105.0**	**134.8**	**117.3**	**116.8**	**108.1**	**138.9**	**122.7**	**123.5**	**116.0**	**148.3**	**133.8**	**136.5**	**131.3**	**166.2**	**154.7**	**3,334.0**	

[25] Totals may not sum exactly due to rounding effects.

6.5 ACE Non-Recurring and Recurring Costs

6.5.1 Non-Recurring Costs

The following sub-sections present a non-recurring cost analysis summary. The "Appendix" column in the previous table references the respective appendix containing supporting detail.

6.5.1.1 Infrastructure

Infrastructure costs are those costs associated with equipping ports that process commercial cargo with ACE-related equipment. These expenditures are related to router, circuit, PC and server installation, and hardware. The infrastructure provides connectivity from USCS headquarters to regional sites and ports. The basis of the estimate relies upon a USCS/ISD port-to-port equipment review and deployment schedule. (Refer to Appendix C for additional detail.)

6.5.1.2 Data Center

Data center costs are treated as recurring items. These estimates are based on projections and interviews from USCS/ISD subject matter experts. Costs elements include network management, mainframe upgrades, UNIX expenditures, voice communications, database, server operations, and system security. These costs are detailed in Appendix C.

6.5.1.3 Application Development

Application development costs were derived from the average of the BCM, parametric model, and FPA software estimation models. A significant constraint in developing the estimates is that detailed functional requirements beyond NCAP 0.3, an ACE prototype, were not known. As a result functions (sizings) were established using a sizing index established by the BCM in a previous effort. Since specific requirements beyond NCAP 0.3 were not known, the FPA summarized in this document used the sizing index from the BCM to extrapolate from NCAP 0.3. In addition, as ACE requirements were not firm enough to allow direct sizing estimates, the Parametric Model, which in part relies upon size, uses the FPA to estimate size. Thus the estimates thread back to the BCM for lack of detailed requirements. SAIC recommends that as the functional requirements gain resolution, the estimates be updated. Based upon the results of each estimate, the annual expenditures were weighted equally and summed to develop an average annual application development cost as shown in Table 6-2.

6.5.1.3.1 Business Complexity Model

The BCM, developed by USCS subject matter experts, estimates ACE functional group sizes by identifying business and system features as a percentage of size of the existing ACS system, and existing or planned NCAP releases. USCS applied historic results from early NCAP experience and extrapolated those results on the basis of relative system and business complexity. The advantage of this model is that it reflects USCS developmental experience. However, it is biased towards the early stages of development where code reuse and other operational and organizational efficiencies have not been fully realized. To compensate for this bias, SAIC

averaged the actual software development project phase metrics with industry standards that apply over the project's duration. SAIC also evaluated and updated key assumptions to refine the existing estimate. (This model and its results are detailed in Appendix D.)

6.5.1.3.2 Parametric Model

The parametric model uses systems of comparable scale and scope to serve as a basis of comparison upon which to model a financial estimate. The COSTARS' software estimating model, COCOMO II, is used as the software estimating database. This database, developed under the leadership of Barry Boehm at the University of Southern California, contains industry averages collected on large software development programs implemented in the 1990's. Data collected from the Federal Bureau of Investigation's (FBI's) National Instant Criminal Background Check System (NICS) calibrated the database to determine staffing patterns throughout the ACE project life cycle. Other programs contacted for review included both Civil and Defense department software development programs. (More detail on the systems considered as parametric models are included in Appendix E.)

The parametric analysis requires two assessments prior to accepting a system for comparison. First, the target system must have a similar technology base and functionality. A questionnaire to collect this information was developed and used to screen for suitable parametric matches. If a system appeared as a good match based on the technical and function parameters, available historical cost and schedule data was collected for all software development phases. Based on the requirements, the system selected as a parametric model for staffing patterns was the NICS system. (This model and its results are also detailed in Appendix E.)

6.5.1.3.3 Function Point Model

Separately, an FPA was conducted on NCAP 0.3 to develop a sizing estimate. The analysis consisted of a review of object models along with interviews with subject matter experts for each business function. From this analysis, a function point size for the entire ACE system was developed. Because limited information was available in the way of requirements or design documents for any of the functional groups beyond NCAP 0.3, it was impossible to perform a detailed function point count for each functional group. It was therefore necessary to determine the size of each group by establishing the size relationship between each group and the NCAP 0.3 group. This determination was done on the basis of a sizing index established by the BCM. (This model and its results are detailed in Appendix F.)

Table 6-2: ACE Application Development Estimate (Constant Year Million $—Not Risk Adjusted)

Fiscal Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	App.
Business Complexity	95.4	134.4	109.7	140.6	16.1	12.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	**657.7**	**D**
Parametric	127.8	139.9	138.6	142.3	11.2	10.9	10.6	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8	**744.0**	**E**
Function Point	140.1	187.4	170.6	102.6	21.5	12.2	10.5	9.1	7.5	6.0	4.9	4.5	3.8	3.4	3.1	2.8	2.6	2.4	2.2	2.1	1.9	1.8	**703.2**	**F**
Average	**121.1**	**153.9**	**139.6**	**128.5**	**16.3**	**11.8**	**10.2**	**9.7**	**9.2**	**8.7**	**8.4**	**8.2**	**8.0**	**7.9**	**7.8**	**7.7**	**7.6**	**7.5**	**7.5**	**7.4**	**7.4**	**7.3**	**701.6**	

6.5.2 Recurring Costs

The following sub-sections present a summary analysis of the recurring cost categories. The "Appendix" column in Table 6-1 references the respective appendices containing supporting detail.

6.5.2.1 Infrastructure

Recurring infrastructure costs are driven by a port-by-port deployment schedule identifying when each locale is slated to receive equipment upgrades. The initial infrastructure recurring costs reflect a rolling four year replacement cycle for PC's, and servers. After the initial deployment, infrastructure is assumed to be replaced at a constant rate throughout the remainder of the life cycle. As such, the initial installation is treated as a non-recurring cost and subsequent upgrades are treated as a recurring cost. Circuit costs include the Executive Treasury Telecommunications Charge assessed for carrying network traffic. (Refer to Appendix C for additional detail.)

6.5.2.2 Data Center

Projections from USCS/ISD subject matter experts form the basis of the data center cost estimate. Cost elements include network management, mainframe upgrades, UNIX expenditures, voice communications, database, server operations, system security, and ACS life support costs during development and for two years after implementation. (Appendix C also contains data center cost estimate detail.)

6.5.2.3 Application Development

Recurring application development costs represent software maintenance activities necessary for continued maintenance operations but not the additional of new functionality.

7 ACE Internal Benefit Analysis

This section describes the methodology used to calculate both the quantifiable and non-quantifiable internal benefits accruing to the U.S. Treasury Department. The five quantifiable internal benefit categories capture improved revenue recovery and benefits associated with various labor avoidance or productivity improvements. The analysis also identifies key benefit drivers influencing the sensitivity and risk analyses in Section 9. The results of the analysis are presented at the end of this section. A discussion of non-quantifiable internal benefits including secondary benefits accruing to other USCS IT users is added at the end of the section.

7.1 Description

Implementing ACE will significantly impact many individual business processes and USCS operations. The specific intermediate/system performance attributes of ACE that create these impacts are:

- *Processing Speed*—ACE will perform many functions more rapidly than the current system, even if ACS is maintained at its current level of performance.
- *Data Accuracy*—Data in ACE will be more consistent, accurate, and up-to-date.
- *System Reliability*—ACE will be more reliable and users will experience less downtime or diminished performance, even if ACS is maintained at its current level.
- *New Functionality*—ACE will enable users to do tasks previously completed through other means, including paper processing.
- *User-Friendliness*—ACE will have new applications designed to reduce the need for specialization.

These intermediate/system performance attributes are translated into monetary benefits defined as labor cost avoidance and revenue recovery for internal benefits. Internal benefits both quantifiable and non-quantifiable, are any cost savings or level of service improvements accruing directly to system users within the U.S. Department of Treasury. Each sub-section addresses quantifiable benefits first followed by a qualitative discussion of non-quantifiable benefits.

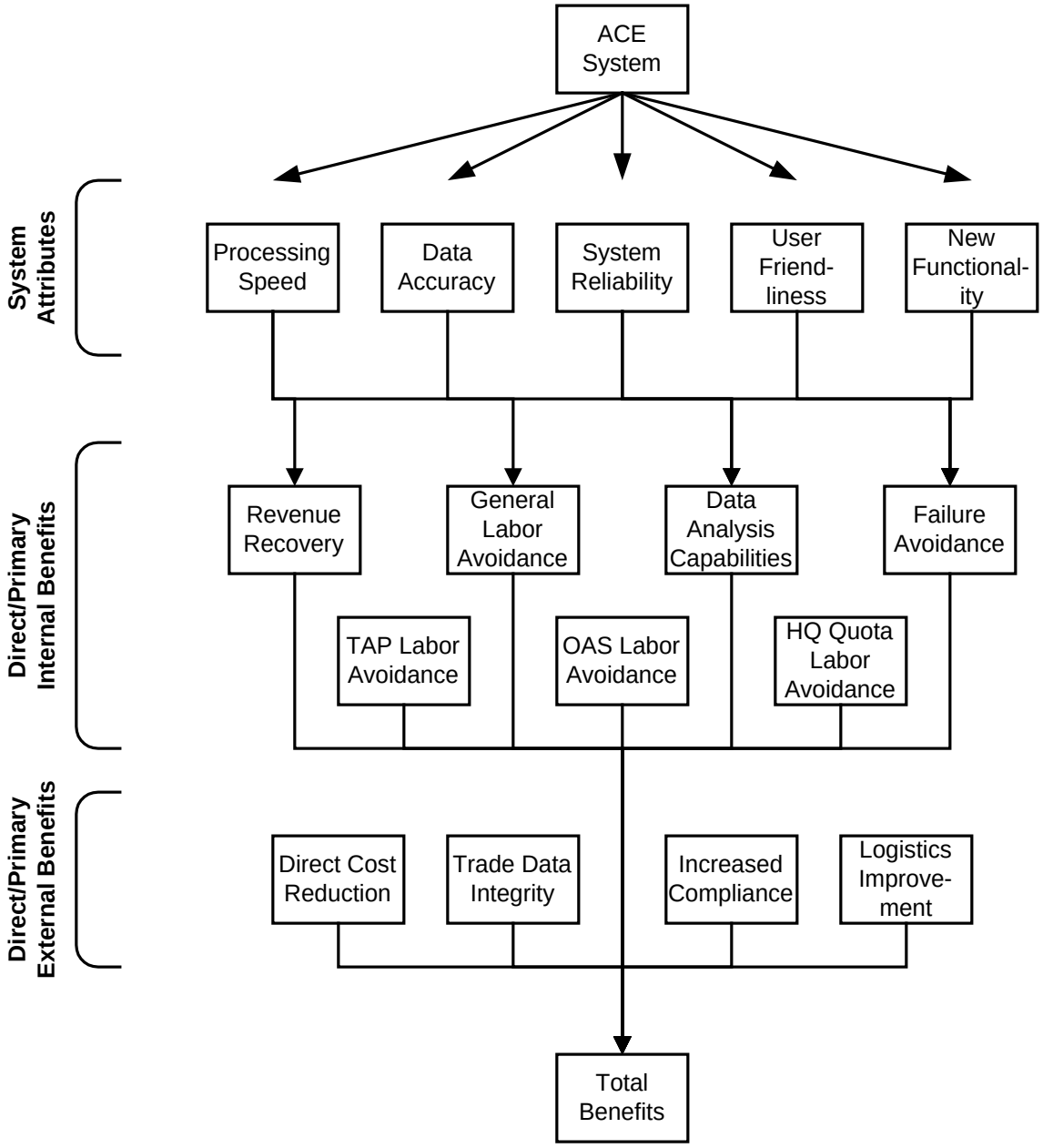
As previously stated, the difference in attributes between ACE and the ACS base case at any given point in time (due to differences in functionality) generates internal benefits. Given that in the ACS base case is only maintained without any improvement in functionality or performance, the benefits attributable to ACE are significant. This section discusses the most significant areas of benefits. Additional benefits could be incorporated in future analyses, as estimates of any additional revenue or cost improvements become available. The following list describes the quantifiable internal benefits:

- *Revenue Recovery*—ACE will reduce the undercollection and/or overpayment of revenue.

- *Labor Avoidance*—ACE will provide new functionality, creating greater efficiency at current staffing levels in many different USCS areas:
  - *General Labor Avoidance*—ACE will provide greater efficiency at current staffing levels and reduce the need for additional staff to handle increased trade volumes.
  - *TAP Labor Avoidance*—ACE will provide for more efficient TAP data retrievals and reduce the need for staff associated with this task.
  - *Operational Analysis Staff (OAS) Support Labor Avoidance*—ACE will reduce the need for OAS support staff to develop complex queries.
  - *Improved Data Analysis Capabilities*—ACE will provide a cost-effective and repeatable process for data analysis.
  - *Headquarters (HQ) Quota Labor Avoidance*—ACE will provide for more efficient quota management.
- *Failure Avoidance*—ACE will provide a more stable operating environment and reduce system failures and downtime.

Figure 7-1 summarizes the internal benefits estimation process. It shows the links between ACE, ACE attributes, and the benefits generated by these attributes. The remainder of this section presents the specific assumptions used to estimate internal benefits and a detailed discussion of each benefits category, including a description of the benefit, the USCS business areas impacted, the formulae used to estimate benefits, and the key benefits drivers.

Figure 7-1: Benefits Estimation Overview



7.2 Assumptions

This sub-section presents the primary assumptions used in the internal benefits analysis. The monetary estimates of internal benefits require a range of assumptions related to labor growth in the absence of technological innovation, salary escalation, and revenue capture rates. Section 9 analyzes the implications of these assumptions on the analysis results in a risk analysis framework.

7.2.1 Life Cycle Time Horizon

This analysis assumes a 22-year time horizon. This length of time is appropriate for the study due to the object-oriented framework of the system. The amount of effort required developing the system and the fact that the life cycle of the legacy system (ACS) will exceed 20 years by the time of retirement further support this assumption. (Refer to the Life Cycle Time Horizon Section of Appendix G for a discussion of assumptions and data sources.)

7.2.2 Participation Factor

Many benefits and costs are based on the volume of transactions processed by ACE. Therefore, it is necessary to determine how transaction volumes are expected to grow throughout implementation. To distinguish between transactions processed by ACS and ACE, a growth curve is used to estimate the percent of total transactions processed by ACE for each year.[26] The analysis uses the following mathematical relationship:[27]

$$V = V(t) = 0.6621e^{0.8904t}$$

Where:

V = Transaction Processing Rate

t = year

The transaction processing rate (V) is the percent of transactions processed by ACE at the end of a year. One minus this rate is the percent of transactions processed by ACS, the base case system. To determine the total percentage of transactions processed by ACE, the area under the curve, the following definite integral is used:

$$V(t)\,dt$$

The volume of transactions processed by ACE grows from 0% in FY 2000 to 100% by FY 2003 in accord with a four-year deployment schedule. This relationship mirrors the one developed in a prior analysis.[28] The processing of transactions by ACE is dependent on the following factors, assumptions, and data sources:

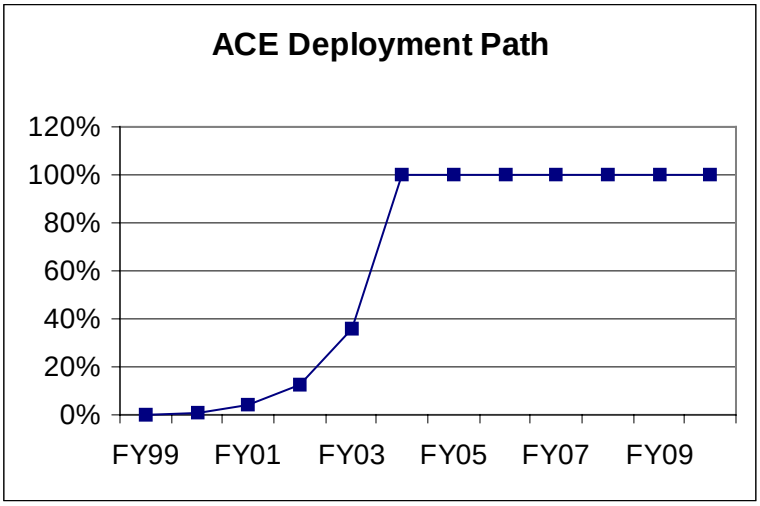
- Timing of functionality provided;
- Timing of mode of transportation support provided;
- Timing of the new system deployment to ports of entry;

[26] Cambridge Technology Partners originally developed the data used to derive the relationship. A complete discussion is provided in *ACE Technical Architecture, v1.1*, August 1997.
[27] This standard mathematical formulation is used when the objective is to trace the time path of a variable (V). The variable t is used to denote the value of V in any given year. Such as year 1, V(1), or year 2, V(2).
[28] *ACE Technical Architecture, v1.1*, prepared by Cambridge Technology Partners for the United States Customs Service, August 1997.

- The curve is based on the data and analysis developed by Cambridge Technology Partners;
- Projected import values obtained from the Treasury Office of Tax and Policy (OTP) data and official U.S. Census data;
- All transactions (100%) handled in four years.

Figure 7-2 shows the percentage of transactions handled by ACE over time. By the end of the fourth year, ACE handles 100% of all transactions.

Figure 7-2: Participation Factor



Note: While the figure only displays the years to FY 2010, full operation continues to the end of the analysis period (FY 2021).

7.2.3 Productivity Realization Factors

Productivity improvements are the most common type of benefits cited in IT investment analyses. Improved efficiency and resulting free time to perform additional work may generate large or small time savings increments. If time savings occur in very small increments, significant productivity improvements will only accrue if task repetition is high. This condition may not apply in all situations and locations. For example, at border crossings, saving seconds on a transaction, even one performed infrequently, is important and can be turned into other productive work. In other situations, such as administrative office work, only time savings in large increments results in measurable productivity improvements. As such, on average across a large geographically diverse organization, the factors provide a sensible approach to adjusting potential productivity improvements. Translating small time savings into larger blocks of time (i.e., person-years) is limited by three factors:[29]

[29] A person-year is defined as the average number of hours worked in a given year, not including holidays and vacation time. For this analysis 1,920 hours is assumed to be the average work hours.

- The size of the time savings by task;
- The frequency the task is performed daily by an individual staff member; and
- The number of staff performing the task.

For example, saving five seconds per task is not significant if one staff member performs the task only once a day. If 100 staff members perform the task 100 times a day, then there is a greater opportunity to realize the productivity gains. Regardless of the size of the increment, the tradeoff between time savings and new productive work is not uniformly 100%. Productivity realization factors adjust productivity improvements to more realistically reflect potential outcomes. The realization factors in this analysis are presented in the following table. Table 7-1 shows that tasks saving fifteen minutes or greater and are performed frequently by a large number of staff are going to generate the largest total savings.

Table 7-1: Productivity Realization Factors

Score	Factor 1 Time Savings (t=time savings)	Factor 2 Task Frequency (f=daily task freq.)	Factor 3 Number of Staff (s=number of staff)
1	t < 1 Min.	f < 10	s < 10
2	1 Min. < t < 5 Min.	10 < f < 50	10 < s < 50
3	5 Min. < t < 15 Min.	50 < f < 100	50 < s < 100
4	15 Min. < t	100 < f	100 < s

Combined Score (sum of 1, 2, 3)	Productivity Realization Factor
3	5.0%
4	10.0%
5	20.0%
6	30.0%
7	40.0%
8	50.0%
9	60.0%
10	70.0%
11	80.0%
12	90.0%

Note: This table is based on expert opinion and reasoned judgment on the ability of organizations such as USCS to realize productivity improvements.

7.3 Quantifiable Internal Benefits

The following sub-sections describe the estimation approach and assumptions for each quantifiable internal benefit. The quantifiable internal benefits include revenue recovery, general labor avoidance, Trend-Analysis and Analytical-Selectivity Prototype (TAP) labor avoidance, Operational Analysis Staff (OAS) labor avoidance, improved data analysis capabilities, and Headquarters (HQ) Quota labor avoidance. For TAP labor avoidance, OAS Staff labor avoidance, and HQ Quota labor avoidance, it is important to realize that current ACS system functionality is assumed to be constant and does not achieve the functionality required by the Mod Act. As such, ACE productivity improvements and time savings are likely to be very substantial when compared to ACS.

7.3.1 Revenue Recovery

One of the more readily quantifiable internal benefits is revenue recovery. Undercollection of revenue primarily results from misclassification, quantity discrepancy, and undervalued merchandise. The planned ACE functionality is critical to the agency's efforts to minimize revenue undercollection. This functionality encompasses several system features that will work in concert to promote revenue recovery. These features include:

- Account Management Automation Support—A collection of features to support account-based processing and informed compliance. These features will include account activity profiles to automatically alert Customs to problem areas and periodic "report cards" transmitted to importers to be used to initiate corrective actions and monitor improvements.

- Advanced Trend Analysis and Targeting Capabilities—A user-friendly means to manipulate vast amounts of import data to identify anomalies and trends that warrant further action by Customs.

- Automated Prioritization of Compliance Problems—A rules-based system that triggers reviews of compliance problems, helps identify where Customs resources would be most efficiently used, and recommends the types of action Customs should pursue in response.

- Electronic Routing to Promote Port Specialization—Electronic distribution of work will allow import specialists to focus on single industries and improve their technical knowledge on revenue-related issues.

Customs is currently testing these ACE concepts through programs such as TAP, Enforcement Evaluation Teams, and Tariff Sharing among ports. These programs have limited automation support and will not attain their intended effectiveness until ACE is fully implemented. Nevertheless, TAP, in particular, has provided early indications of the effectiveness that ACE revenue recovery-related features will have to offer. The impact of other revenue-recovery concepts can be estimated only when their associated programs have undergone further development and evaluation.

Estimation Approach

Revenue recovery is based on attaining the Trade Compliance goals of 95% compliance in Primary Focus Industries and 90% compliance overall.[30] The sooner ACE enables USCS to attain these goals, the sooner the U.S. Treasury will enjoy additional revenues. USCS can reach these goals through full implementation of the ACE revenue recovery concepts described previously. Attaining the target compliance rates as presented in the following table derives the recovered revenue.

[30] The data for the revenue recovery analysis were provided Cambridge Technology Partners and the FY 1997 Trade Compliance Measurement Report, Department of the Treasury, U.S. Customs Service, January 1998. A complete discussion is provided in *ACE Technical Architecture, v1.1*, August 1997.

Table 7-2: Trade Compliance Goals

Trade Compliance Area	Current Compliance Rate	Target Compliance Rate	Current Discrepancy Rate	Target Discrepancy Rate
Overall	81.30%	90.00%	18.70%	10.00%
PFI	83.48%	95.00%	16.52%	5.00%

Source: FY 1997 Trade Compliance Measurement Report, Department of the Treasury, U.S. Customs Service, January 1998.

The analysis estimates the annual reduction in revenue undercollection, annual discrepancy rates, and projected revenue undercollection for the PFI and overall Trade Compliance. The impact of TAP has been included in the base case to avoid overestimating the benefits of ACE and because TAP has already been deployed in 40% of service ports. In addition, TAP has been shown to reduce revenue undercollection in an ACS environment. The annual reduction in undercollection is calculated based on the premise that revenue undercollection will decrease proportionally as the annual discrepancy rate decreases.[31] This allows the reduction in revenue undercollection to be calculated for each 4-digit Harmonized Tariff Schedule of the United States (HTSUS) using the following formula:

*Reduction in Undercollection = $ per Percentage Point Change in the Discrepancy Rate * Change in the Discrepancy Rate * Participation Factor*

Where,

$ per Percentage Point Change in the Discrepancy Rate = Revenue Undercollection FY 98[32] / Current Discrepancy Rate FY 98

Change in Discrepancy Rate = Current Discrepancy Rate FY 98 – Discrepancy Rate after Implementation

If the annual discrepancy rate is above the target discrepancy rate, then reducing the discrepancy rate will reduce revenue undercollection by an amount proportionate to the change between the annual and target discrepancy rates. For example, if revenue undercollection is $15 million, the annual discrepancy rate is 15%, and the target discrepancy rate is 10%, then the reduction in undercollection is $5 million. This equation does not exclude the possibility that after implementation the discrepancy rate may exceed the target discrepancy rate. (Refer to the Revenue Recovery Section of Appendix G for a discussion of assumptions and data.)

Key Benefit Drivers

The primary factors driving revenue recovery benefits are trade growth, annual revenue undercollection, participation factor (i.e., implementation period), and ability to meet trade

[31] Even though discrepancies can be either revenue related or non-revenue related, ACE is expected to reduce discrepancies evenly between the two. As such, the mix of discrepancy types will not change from ACS to ACE; just the number will decrease. Based on this it can be assumed that a decrease in the discrepancy rate will have a direct and proportional impact on reducing revenue undercollection.

[32] The FY 98 estimate for revenue undercollection is the new difference between revenue undercollection and revenue refunded.

compliance goals (i.e., annual discrepancy rates). Specific attention is given to revenue undercollection since the current value is a statistical estimate by USCS. The reasons that the value has significant uncertainty is that, although the sample size for many of the HTSUS categories is large, the number of revenue related discrepancies is small. Secondly, year to year changes is very unpredictable.[33] The uncertainty surrounding these factors is considered as part of the sensitivity and risk analysis in Section 9.

7.3.2 Labor Avoidance Benefits

A primary ACE goal is to achieve greater efficiency at current staffing levels and free capacity for the expected growth in trade volume. Current staff will be able to handle increased import volumes while maintaining or improving current service levels. In addition, sufficient labor capacity will be generated possibly affecting base case hiring plans. Labor avoidance necessarily relies on an assumption of future labor growth and productivity improvements that are difficult to predict. Therefore, any estimate will contain an element of uncertainty.

Implementing ACE will impact multiple processes at many different levels and locations. These impacts will range from small to very large. The size of the impact will ultimately be determined by the amount of improvement, in minutes, over and above the performance of the base case system. Labor avoidance benefits are estimated for USCS in general and for four specific task areas. To avoid double counting, no task considered under general labor avoidance is considered in any of the four specific labor categories. The labor avoidance benefits estimated in the following sub-sections are:

- General labor avoidance;
- TAP labor avoidance;
- OAS support labor avoidance;
- Improved data analysis capabilities; and
- HQ quota labor avoidance.

While the labor avoidance benefits estimated in this section cover a broad cross section of USCS, they should by no means be considered inclusive. Each labor avoidance benefit category is addressed in turn.

7.3.2.1 General Labor Avoidance

The specific ACE attributes and functions that will improve productivity and service levels include processing speed, data accuracy, new functionality, and user-friendliness. The types of transactions and/or processes likely to be impacted include:

[33] *FY 1998 Accountability Report*, United States Customs Service, Washington, DC, 1998.

- Line Release—Northern Border
- Line Release—Southern Border
- Border Cargo Selectivity
- ACS Cargo Selectivity
- Bypass Paper Summary Processing
- Basic Team Review Paper Summary Processing
- Anti-Dumping/Countervailing Duty (AD/CVD) Additional Team Review Processing
- Quota Additional Team Review Processing
- Other Government Agency (OGA) (not quota or AD/CVD) Processing
- Warehouse Add. Team Review Processing
- Temporary Importation under Bond (TIB) Additional Team Review Processing
- Protests/Petitions
- Reconciliation
- Drawback
- Change Liquidations
- Re-liquidations
- Collections
- Refunds
- Continuous Bonds
- Surety Power of Attorney
- Violation of Billing

Estimation Approach

Total labor savings are calculated by estimating the cycle time reduction of ACE over and above the performance of the base case ACS system for each of the transactions and/or processes impacted. (Refer to the Labor Avoidance Section of Appendix G for a discussion of assumptions and data needs.) The following formula is used to calculate total labor avoidance savings:

Total Labor Avoidance = *Annual Transactions * Cycle Time Reduction * Productivity Realization Factor * Total Labor Cost * Participation Factor*

Where:

Total Labor Cost = *Labor Rate * (1+ Overhead Rate) + Facilities Cost*

Key Benefit Drivers

The primary factors affecting labor cost avoidance are the impact of system attributes on each existing process, the relationship of transaction volume to trade growth, participation factor (i.e., implementation period), and productivity realization factor. The influence of these factors on the analysis results is considered as part of the sensitivity and risk assessment.

7.3.2.2 TAP Labor Avoidance

It is expected that ACE will contain functionality similar to the current TAP system that has been deployed to 40% of the ports. TAP has demonstrated the potential to decrease revenue undercollection/increase revenue collection. In addition, TAP functionality reduces the cycle time associated with the large data queries that import specialists perform. While this benefit is similar to the improved data analysis capability benefits accounted for separately, these benefits are distinguished independently because they are not accounted for in any other labor avoidance category. The specific system attributes and functions that create benefits include:

- Data accuracy;
- Trend detection and analysis;
- User-friendliness;
- Performance measurement; and
- Fulfillment of internal and external reporting requirements.

Estimation Approach

The cycle time savings are measured as the difference between system performance in the base case for import specialist queries versus ACE. The import specialist queries (independent of the queries considered as part of improved data capability benefits) to retrieve data are very "large" in terms of the number of records. As with other queries, the cycle time consists of three stages: setup time, download time, and data manipulation time. Each is explained in detail in the improved data capability benefits section. (Refer to the TAP Labor Avoidance Section of Appendix G for a discussion of assumptions and data.) The following formula is used to calculate annual TAP labor cost avoidance:

Annual TAP Labor Savings = *Specialist Queries per Year * Saving per Query * Participation Factor*

Where:

Saving per Query = *Total Labor Cost * Time Savings per Query * Productivity Realization Factor*

Total Labor Cost = *Labor Rate * (1+ Overhead Rate) + Facilities Cost*

Time Savings per Query = *ΔSetup Time + ΔDownload Time + ΔData Manipulation Time*

Key Benefit Drivers

The primary factors driving TAP labor avoidance costs are the number of specialist queries per year, the time savings per query versus the base case system, participation factor, and

productivity realization factor. These factors receive the focus of the sensitivity and risk analysis.

7.3.2.3 OAS Support Labor Avoidance

Currently, many import specialists rely on OAS to retrieve the data they need for their analyses. Approximately one OAS staff member supports 20 import specialists. It is anticipated that inclusion of TAP functionality in ACE will allow import specialists to perform analysis with less support from OAS. The specific system attributes and functions that will enable OAS support staff to improve productivity and service levels include:

- Processing speed;
- Data accuracy;
- New functionality; and
- User-friendliness.

Estimation Approach

Benefits stem from the reduction in OAS support staff as measured by the difference between OAS support staff needed in the base case system versus that of ACE. (Refer to the OAS labor cost avoidance section of Appendix G for a discussion of assumptions and data.) The formula used to calculate these benefits is:

*Annual Productivity Savings = Import Specialists * Change in OAS Support Staff Ratio * Productivity Realization Factor * Participation Factor * Total Labor Cost*

Where:

*Total Labor Cost = Labor Rate * (1+ Overhead Rate) + Facilities Cost*

Key Benefit Drivers

The primary factors driving OAS labor avoidance benefits are the current number and projected number of import specialists, participation factor, and reduction in support requirements. These factors receive the focus of the sensitivity and risk analysis conducted as part of this project.

7.3.2.4 Improved Data Analysis Capabilities

ACE will improve data analysis capabilities beyond the base case ACS. For example, ACE contains an ACE data warehouse (ADW), which provides USCS staff with far superior data analysis capabilities. This is possible since the ADW defines and contains a cost-effective and repeatable process for identifying, supplying, and managing the data needed to support analytical efforts. Data analysis capability performance over and above that provided by ACS will result in

quicker data retrievals and productivity gains for staff members. The specific system attributes and functions that create benefits include:

- Informed decision making;
- Trend detection and analysis;
- Performance measurement; and
- Ability to fulfill internal and external reporting requirements.

Estimation Approach

Improved data analysis benefits are based on reductions in labor and time savings associated with improved cycle time retrieving data. Cycle time improvements are measured against the cycle time of ACS. Benefits are positive if cycle time is less than that provided by ACS and negative if greater. The following formula calculates data analysis benefits:

*Annual Productivity Savings = Queries per Year * Saving per Query * Participation Factor*

Where,

*Saving per Query = Total Labor Cost * Time Savings per Query * Productivity Realization Factor*

*Total Labor Cost = Labor Rate * (1+ Overhead Rate) + Facilities Cost*

Time Savings per Query = ΔSetup Time + ΔDownload Time + ΔData Manipulation Time

A typical large query to retrieve data using ACS from the mainframe consists of three stages: setup time, download time, and data manipulation time. Setup time consists of the time a skilled programmer or analyst requires designing a data query. It can take up to two and a half hours to set-up a large query. Download time represents the time necessary to download query results. This can take from 30 minutes to two hours. Data manipulation time is required to transform the data into a presentable format (often into a spreadsheet), and transfer results to the group requesting the information. Data manipulation tasks takes one to two hours. (Refer to the improved data analysis capability section of Appendix G for a discussion of assumptions and data.)

Key Benefit Drivers

The primary factors driving data analysis capability benefits are queries per year, savings per query, participation factor, and productivity realization factor. These factors are the primary focus of the sensitivity and risk analysis in Section 9.

7.3.3 HQ Quota Labor Avoidance

HQ Quota is the functional area at USCS that enforces quotas of goods entering the U.S. There are a number of labor intensive tasks performed by HQ quota staff that would be automated with ACE. The specific system attributes and functions that improves productivity and service levels include:

- Processing speed;
- Data accuracy;
- New functionality; and
- User-friendliness.

Implementing ACE will impact many processes at HQ Quota at many different levels. These impacts will range from small to very large. The size of the impact will ultimately be determined by the amount of improvement, in minutes, over and above the performance of ACS. The types of transactions and/or processes to be impacted by HQ Quota include:

- *File Maintenance*—Master Records;
- *File Maintenance*—Equivalence Records;
- *File Maintenance*—Quality Exception Records;
- *Quota Hold Records*—Hold to Fill;
- *Quota Hold Records*—Pro-rations;
- *Quota Hold Records*—Year End/Start;
- Special Processing:
  - Raw Cane Sugar;
  - Ethanol;
  - Minimum Access Quota;
  - Fast Filing/High Volume Tariff-Rate;
  - Textiles;
- Quota Questions and Answers; and
- Weekly Critical List.

Estimation Approach

In order to calculate the total HQ Quota labor savings of the new system, it is necessary to estimate the time savings over and above the performance of ACS for each of the transactions and/or processes impacted. (Refer to the HQ Quota section of Appendix G for a discussion of assumptions and data.) The following formula calculates total labor avoidance savings:

*Total Labor Savings = Annual Transactions * Cycle Time Reduction * Productivity Realization Factor * Total Labor Cost * Participation Factor*

Where:

*Total Labor Cost = Labor Rate * (1+ Overhead Rate) + Facilities Cost*

Key Benefit Drivers

The primary factors driving HQ Quota benefits are the impacts of system attributes on each existing transaction and/or process, relationship of transaction volume to trade growth, participation factor (i.e., implementation period), and productivity realization factor. These factors are addressed in the sensitivity and risk analysis section.

7.3.4 Failure Avoidance

It is expected that implementation of ACE will improve the overall reliability of the IT infrastructure and reduce the frequency of certain failures related to stresses on the current system. It is estimated that these stresses are likely to increase despite further planned investments. The current failures are costly, impacting the data center, CMC's, and ports. The specific system attributes and functions that will improve service levels include system reliability and new functionality. (The cost of this category is discussed in Appendix B.)

Estimation Approach

In order to calculate the total failure avoidance benefits of ACE, it is necessary to estimate the costs these failures impose on the base case system (ACS) and if and when base case system investments have any impact (i.e., fewer failures). The following formula is used to calculate failure avoidance savings:

*Total Failure Avoidance = Failures Avoided * Cost per Failure * Participation Factor*

The cost of current failures is included in Section 5 as it represents a cost of maintaining the base case system.

Key Benefit Drivers

The primary factors driving failure avoidance benefits are duration and frequency of stress related failures, cost of a failure, port reactions to failures of varying duration, and data center responses to system stress and failure. These drivers will receive the focus of the sensitivity and risk analysis.

7.3.5 Quantifiable Internal Benefits Results

The internal benefits analysis results are presented in Table 7-3. The benefits are calculated using the equations presented in this section and the data contained in Appendix G. As the table shows, total internal benefits in millions of discounted dollars for ACE with a four-year deployment is more than $3.2 billion. The large benefit value results from one primary reason: ACE conforms with the Mod Act while ACS does not. As such, ACE reaps all the benefits associated with the additional revenue recovery and productivity improvements. Additional revenue recovery is the primary benefits driver and accounts for 88% of the total.

In addition to the monetary results, labor time savings in hours as well as person-years is presented. The benefit category that yielded the most time savings is general labor avoidance. This is not surprising since this category estimated the most wide-ranging impacts of all the labor avoidance benefit categories. The others focused on more specific impacts. Over 22 years, the total number of person-years saved is 17,350, which will become available to perform additional work and keep pace with expanding trade volume.

Table 7-3: Internal Benefits Results

Internal Benefit Category	ACE Benefits
Revenue Recovery Analysis Results	
New Revenue Recovery (PV $M)	$2,864
Labor Avoidance Analysis Results	
Time Savings (Hours)	28,189,822
Time Savings (Person-Years)	14,682
Labor Savings (PV $M)	$301
TAP Labor Avoidance Analysis Results	
Time Savings (Hours)	1,971,589
Time Savings (Person-Years)	1,027
Labor Savings (PV $M)	$26
OAS Labor Avoidance Analysis Results	
Time Savings (Hours)	571,514
Time Savings (Person-Years)	298
Labor Savings (PV $M)	$8
Data Analysis Capability Results	
Time Savings (Hours)	2,529,816
Time Savings (Person-Years)	1,318
Labor Savings (PV $M)	$45
HQ Quota Labor Avoidance Results	
Time Savings (Hours)	49,117
Time Savings (Person-Years)	26
Labor Savings (PV $M)	$0.7
Summary	
Time Savings (Hours)	33,311,858
Time Savings (Person-Years)	17,350
Total Revenue Recovery ($M)	$2,864
Total Labor Savings ($M)	$381
Total ACE Internal Benefits (PV $M)	**$3,246**

The following figures represent the internal benefits of ACE. In Figure 7-3, ACE reduces revenue under-collection by conforming to the Mod Act. Since ACS does not achieve

functionality defined by the Mod Act, the under-collection gap continues to grow with trade growth. The area between the two curves represents the benefits attributable to ACE.

Figure 7-3: ACE Revenue Recovery Benefits

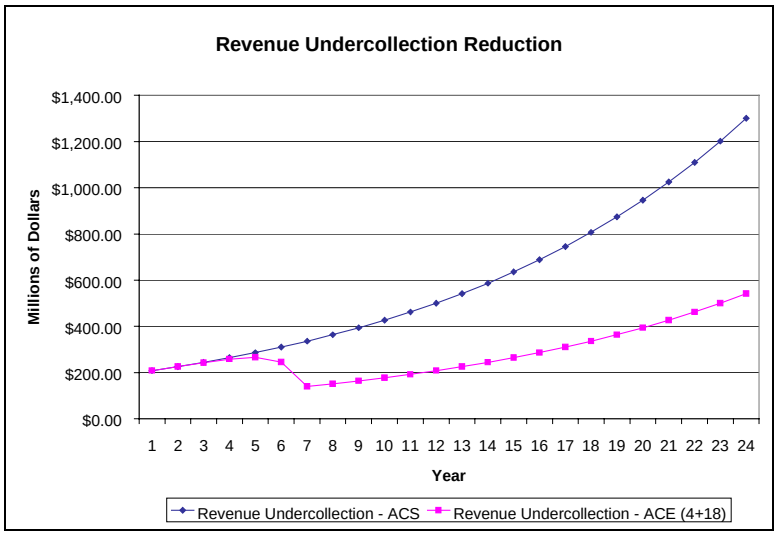
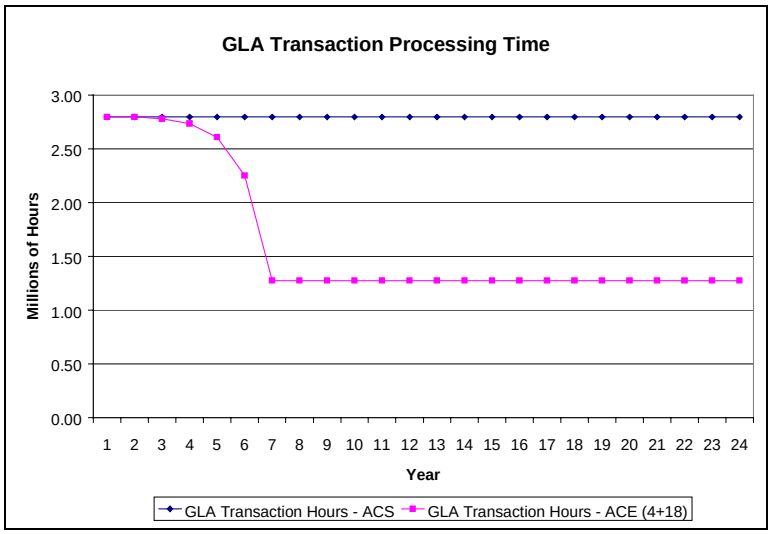


Figure 7-4 shows the underlying assumptions of no new ACS functionality and productivity improvements as demonstrated by the flat ACS curve. ACE generates significant productivity improvements represented as the area between the two curves (the labor avoidance benefits).

Figure 7-4: ACE General Labor Avoidance Benefits



7.4 Non-Quantifiable Internal Benefits

The benefits in the following list do not represent a comprehensive view of all non-quantifiable internal benefits anticipated from ACE. For example, the following system attributes and benefits not only lead to improved productivity but have additional impacts including:

- *Data Accuracy*—ACE data will be more accurate and up-to-date. While the value of improved data integrity and timeliness may be hard to quantify there is no doubt that better data will facilitate trade tracking, management, and trade negotiators. Secondary benefits accrue to other governmental agencies as well.

- *System Reliability*—ACE will be more reliable and users will experience less downtime or diminished performance.

- *New Functionality*—ACE will enable users to do tasks previously completed through other means.

- *User-Friendliness*—ACE will have new applications designed to reduce need for specialization.

- *Improved Working Environment*—A more stable and user-friendly system will help staff improve productivity without the disruptions associated with ACS.

- *Resource Scheduling*—A more stable system will give management more predictability when planning and allocating resources.

8 ACE External Benefit Analysis

This section examines the quantifiable and non-quantifiable external benefits resulting from an ACE investment decision. The section establishes the external benefit categories accruing to both the trade community and society, describes the methodology and key benefit drivers, and then reports the results. A significant analysis of non-quantifiable benefits accruing to the trade community is included. Emphasized throughout is that external benefits estimates carry great uncertainty. The trade community is hesitant to provide insight into their competitive transaction processing cost structures, and societal benefits by nature are difficult to gauge. However, many ACE features can be expected to improve the efficiency and effectiveness at which USCS achieves its public mission.

8.1 Overview

The USCS mission is to ensure that all goods and persons entering and exiting the U.S. do so in accordance with all U.S. laws and regulations. Specifically, USCS is tasked with preventing illegal trade practices, assessing and collecting revenues in the form of duties, taxes and fees on imported merchandise, and regulating the movement of persons, carriers, merchandise, and commodities between the U.S. and other nations.

Through IT modernization, USCS will improve interactions with the trade community by reducing processing time, improving compliance with trade and tariff regulations, and improving the flow of commodities across international borders. In addition, USCS's ability to better perform its mission will impact society in general. As with internal benefits, the intermediate/system performance attributes (i.e., improved processing speed and added functionality) drive external benefits. These impacts are translated into monetary benefits.

For the most part, direct cost reductions can be estimated, recognizing that trade community members are reluctant to reveal cost structures which are a competitive advantage. The other benefit areas for the trade community are less quantifiable. With respect to society, increased compliance and trade data integrity have the greatest impact and can be estimated, recognizing that the links between ACE attributes and society are difficult to establish. The ACE external benefits to the trade community are summarized below:

- *Direct Cost Reduction*—Benefits achieved through reductions in direct cost such as labor, materials, handling, courier services, etc. resulting from paperless processes, increased system reliability (compared to ACS), and greater functionality.

- *Increased Compliance*—Benefits achieved through increased compliance that lead to reduction or elimination of corrective actions, cargo examinations, audits, penalties, investigations, and other actions related to non-compliance.

- *Logistics Improvement*—Benefits that result in increasing the predictability of cargo movements across the border and fewer and shorter delays at the border achieved through expedited processing.

- *Trade Data Integrity*—Benefits that result in better trade data to support trade decisions by individual importers, more informed trade negotiations by trade representatives, and better assessment of trade compliance.

External benefits, both quantifiable and non-quantifiable, are defined as any cost savings or level of service improvements accruing to groups (i.e., brokers, carriers, and public) outside the U.S. Department of Treasury. External benefits can be further divided into two sub-categories, benefits accruing to the trade community and benefits accruing to society in general. An example of trade community benefits is a reduction in filing and liquidation costs. An example of societal benefits is increased law enforcement and illegal commodity interdiction including drugs. The following sub-sections address the quantifiable benefits and provide a qualitative discussion of non-quantifiable benefits.

8.2 Quantifiable External Benefits

The difference in performance and functionality between ACE and the base case ACS at any given point in time generates the external benefits. Given that the base case ACS is maintained without improvements in functionality, the benefits attributable to ACE are significant. This sub-section presents estimates of the following quantifiable external benefits.

- *External Benefits*—ACE will impact importers, exporters, and carriers as well as the ability of USCS to perform its public mission. Benefits will accrue to these groups:
  - *Trade Community*—ACE will reduce processing time, provide better compliance with trade and tariff regulations, and improve the flow of commodities across international borders.
  - *Society*—ACE will allow USCS to perform its public mission more effectively leading to increased narcotic interdiction rates and other secondary effects.

8.2.1 Trade Community Quantifiable Benefits

USCS is modernizing its data systems so that the trade community can benefit from reduced processing time, better compliance with trade and tariff regulations, and the improved flow of commodities across international borders. The functional capabilities of ACE will lower processing costs and generate savings for importers, brokers, and carriers. ACE information flows will eliminate redundant data collection, reduce filing time, and reduce the amount of effort currently required to track and adjust transaction-based activities. Other features include on-line access to cargo and filing status reports, enhanced account management, just-in-time filing, and uniform processing at all ports of entry.

ACE supports the introduction of account-based import processing to the trade community as an alternative to the current process that requires the trade community to account for each shipment as a separate transaction. This fundamental shift in processing features a single account number for each trade member that can be used to record business relationships among trade parties and aggregate transactions by account. The trade community and USCS will be able to process and

analyze individual entry activities in the aggregate rather than on a transaction by transaction basis.

The trade community will benefit in a number of areas. While specific design details of all ACE functions are still under development, several essential benefits are readily apparent:

- *Reduced Data Entry*—ACE will significantly reduce the total data entry requirements for processing a new shipment.

- *Reduced Filings*—The trade community will have the capability to correct large groups of previous filings with a single electronic reconciliation transaction. On-line access to ACE will also reduce the time and effort required tracking the status of filings.

- *Reduced Paper Handling*—ACE will end the current redundant paper/electronic submission of entries/entry summaries and automate numerous paper-based processes.

- *Consolidation of Operations*—ACE provides the capability for the trade community to submit filings electronically from anywhere in the country.

- *Reduced Financial Processing Costs*—ACE will consolidate individual payments and credits into one periodic national payment.

- *Improved Account Access*—Through ACE the trade community will have immediate, anytime/anywhere access to the status of their commercial import activity at any port throughout the U. S.

- *Enhanced Account Management*—The trade community will have electronic access to consolidated account information to improve management of their import activities, e.g., statistics on cargo examinations, filings, and liquidations.

- *National Reconciliation*—USCS has the capability to reconcile the national-based accounts in a completely electronic environment.

- *Just-in-time Filing*—The new automated manifest capabilities in ACE will allow importers, brokers, and carriers to file cargo release documents within 15 minutes of the arrival of a shipment at Customs.

- *Uniform Procedures*—ACE will promote standardization of inspection procedures from port to port.

To realize these benefits, trade community members will develop or acquire computer systems and software that will allow them to exchange information with USCS electronically. Members of the trade community are in the best position to estimate how ACE will affect their organizations. In this task, trade community representatives were asked to provide information about anticipated benefits, expected investment requirements, and other concerns they may have regarding implementation and full deployment of ACE. This information was used to gain a

better understanding of how the trade community believes ACE will benefit them and what costs will be incurred in implementing ACE.

The clear consensus from the trade community members interviewed for this study was that USCS must pursue modernization of their interface with the trade community because the trade community itself is evolving toward paperless processes. In the words of one of the importers interviewed, " USCS is just one element of a logistics chain, and they should not be an impediment to the chain." Trade members interviewed were generally pleased with the efforts USCS has made in automating processes to accommodate the increases in international trade. However, they acknowledge that the current set of independently developed trade applications, known collectively as ACS, does not respond to the Mod Act and is not capable of processing the volume of entries anticipated in the future. In short, the trade community agrees that it is time to replace an antiquated and outdated system.

The opportunity for trade community benefit is best understood in the context of the total cost to the trade community for importing goods into the U.S. In 1997, importers and brokers filed approximately 17.9 million entries representing approximately $845 billion worth of goods to be imported into the U.S. A 1997 study of import processes at eight companies over a three year period found entry filing and liquidation costs to range from $60/entry to $285/entry with an average cost per import transaction of $144/entry and a median cost of $124/entry.[34]

Using the median as a more conservative estimate, this represents a total cost to the trade community for importing goods into the U.S. of about $2.2 billion annually for entry filing and liquidation. A more recent study performed by the International Trade Data System Project Office conservatively estimated the total cost for filing international trade forms relevant to International Trade Data System (ITDS) at about $3.2 billion in 1997.[35] These aggregate indicators of the level and total cost of transactions to the trade community set the boundaries for the external benefit calculations reported later in this sub-section.

ACE is specifically designed to help both USCS and importers reduce the processing burden associated with entry processing. Members of the trade community who contributed to this study acknowledge opportunities for cost reduction due to lower filing costs achieved through remote filing and periodic entry summaries, fewer delays achieved through expedited cargo release, increased compliance achieved through greater visibility into goods classification, and less downtime achieved through more reliable systems. Assuming a modest decrease of 5% in the cost to importers to complete the USCS filing requirements, this represents a potential savings of over $100 million annually to the trade community. However, based on discussions with the trade community, until ACE is better defined, the specific benefit to the trade community will be difficult to pinpoint with a high degree of accuracy.

[34] "Measuring and Improving Import Process Performance," by M. A. Haughton, W. L. Grenoble, E. A. Thomchick, and R. R. Young, Center for Logistics Research, The Penn State University, Working Paper 97-3, August 1997.
[35] "Cost/Benefit Analysis for the International Trade Data System", ITDS Project Office, Washington, D.C., September 1998, p. 2-12.

Estimation Approach

In order to calculate ACE trade community benefits, it is necessary to estimate the filing and liquidation costs of the base case system. The following formula is used to calculate trade community benefits. The results are contained in Table 8-2:

*Trade Community Benefits = Annual Broker Entries * Cost per Entry * Cost Reduction Factor * Participation Factor*

Key Benefit Drivers

The primary factors driving trade community benefits are the number of broker entries, the cost per entry, the cost reduction factor, and the participation factor (i.e., implementation period). As in the internal benefits analysis, these factors are the focus of the risk and sensitivity analysis.

8.2.2 Quantifiable Societal Benefits

Societal benefits accrue to ACE non-users (i.e. society at large) as a result of improved processes. Society may benefit since USCS's ability to perform its mission will improve. Societal benefits mainly result from:

- *Increased Compliance*—Benefits achieved through increased compliance that lead to reduction or elimination of corrective actions, cargo examinations, audits, penalties, investigations, and other actions related to non-compliance.

- *Trade Data Integrity*—Benefits that result in better trade data to support trade decisions by individual importers, more informed trade negotiations by trade representatives, and better assessment of trade compliance.

Increased compliance leads to a reduction of inflow of contraband and other illegal shipments. The system will facilitate identification of goods being smuggled from sanctioned companies and countries. The following table presents historical data on three general categories: drug seizures, intellectual property rights (copyright and trademark violations), and monetary seizures/forfeitures. In addition, the second table identifies specific commodities seized in FY 1998.

Not surprisingly, drug seizures represent a significant area of activity for USCS. Intellectual property, while not the largest category, is significant because it represents a clear link between USCS activities and the protection of U.S. consumers and businesses by preventing the illegal importation of counterfeit goods.

Table 8-1: Historical Data on USCS Seizures[36]

USCS Seizures by Type	FY 96		FY 97		FY 98	
Drug Seizures	**Number**	**Pounds**	**Number**	**Pounds**	**Number**	**Pounds**
Marijuana	12,526	775,065	12,741	719,623	15,545	955,988
Cocaine	2,459	180,947	2,540	166,169	2,364	157,043
Heroin	1,055	2,895	1,209	2,523	1,049	2,957
Other	2,886	n/a	3,066	n/a	4,605	n/a
Total	**18,926**	**958,907**	**19,556**	**888,315**	**23,563**	**1,115,988**
	Number	**$ Millions**	**Number**	**$ Millions**	**Number**	**$ Millions**
Intellectual Property Right Seizures	**2,237**	**47**	**1,943**	**54**	**3,409**	**76**
Monetary Seizures / Forfeitures ($M)						
Seizures		163		184		368
Forfeitures		82		134		126
Total		**245**		**318**		**494**

Table 8-2: Top Intellectual Property Rights Seizures by Commodity[37]

Top Commodities (FY 98)	Domestic Value
Media	$21,773,618
Computers/Parts	$12,620,089
Wearing Apparel	$6,615,939
Toys and Video Game Cartridges	$4,812,372
Fans	$3,522,204
Watches/Parts	$3,387,146
Power Chargers/Converters/Adapters	$2,253,646
Perfumes and Makeup	$2,028,445
Integrated Circuits	$1,735,803
Headwear	$1,554,415
Other Commodities	$15,592,827
Total Domestic Value Seized	**$75,896,505**
Total Number of Seizures	**3,409**

As the tables show, USCS activities prevent many types of illegal products from entering the U.S. The benefits of these activities accrue to society and can be quantified, but the analysis presented in this document only considers the benefits of improved narcotic interdiction activities. These and other societal benefits may be considered in future analyses.

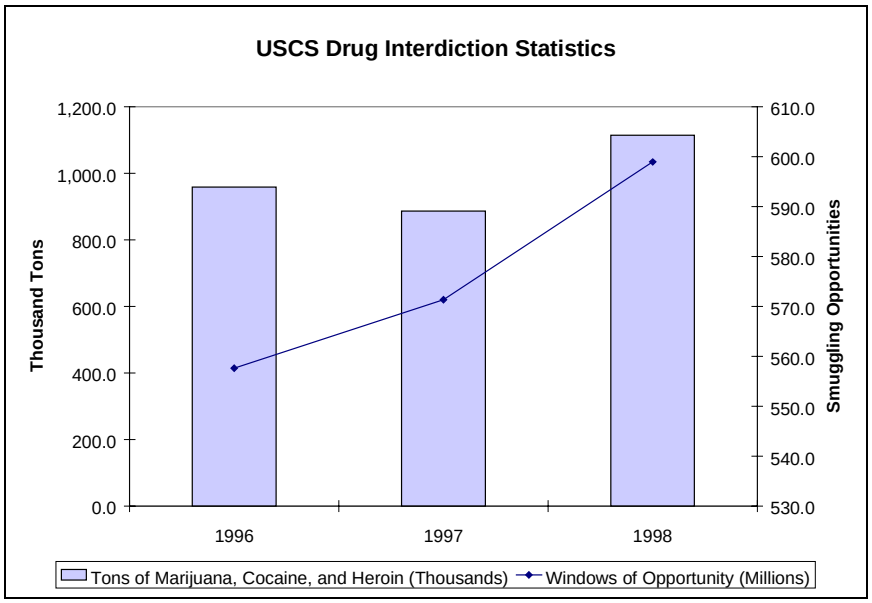
The functionality proposed in ACE may increase the effectiveness of drug interdiction efforts by allowing inspectors to focus on suspect merchandise because the workload associated with compliant importers will decrease. The following figure presents USCS drug interdiction

[36] Source: All data (except Intellectual Property Rights) taken from: *FY 1998 Accountability Report*, United States Customs Service, Washington, DC. Data for Intellectual Property Rights can be found on the USCS website at: www.customs.ustreas.gov/imp-exp2/ipr/stats/tcommod1.htm

[37] Source: www.customs.ustreas.gov/imp-exp2/ipr/stats/tcommod1.htm

statistics from 1996 to 1998. As the figure shows, drug seizures (marijuana, cocaine, and heroin) have increased but so has the number of smuggling opportunities.[38]

Figure 8-1: USCS Drug Interdiction Statistics[39]



The economic costs of drug abuse are well documented. In 1992, drug abuse and dependence cost the US an estimated $98 billion.[40] It is likely that this cost has increased significantly since the time of the assessment. In fact, the outlook for 1995 in 1992 indicated a rise of costs to $110 billion.[41] The costs contain three principal categories:

- Health consequences and their effects on the health care system;
- Criminal behavior, either as a means of individual support, participation in the drug trade, or violence; and
- Job loss, financial destitution, and subsequent reliance on society's safety net.

In 1992, the total spending for health care services related to drug problems was $9.9 billion.[42] In the same year, 25,000 premature deaths were related to drug abuse. The costs associated with productivity losses due to these deaths were estimated to be $14.6 billion.[43] Costs of crime attributed to illegal drug use were estimated at $59.1 billion in 1992. These costs include

[38] Smuggling opportunities is defined as shipments or movements of people, vehicles, trucks, planes, ships, automobiles, etc., by land, sea, and air.
[39] Data provided by the United States Customs Service at www.customs.ustreas.gov/enforcem/hardline/intfact.htm.
[40] National Institute on Drug Abuse, "The Economic Costs of Alcohol and Drug Abuse in the United States – 1992"
[41] ibid, "Updated Cost Estimates: 1992 Estimates and Inflation and Population-Adjusted Costs of Alcohol and Drug Abuse for 1995"
[42] ibid
[43] ibid

reduced earnings due to incarceration, crime careers, and crime victimization, and the cost of criminal justice and drug interdiction. Drug abuse is estimated to have contributed to 25 to 30 percent of income-generating crime.[44] A detailed breakdown of the economic costs of drug abuse is shown in Table 8-3.

The link between ACE, increased drug interdiction, and reduced drug related economic costs, while difficult to accurately assess is nonetheless real. Implementing ACE supports USCS objectives to "work smarter by wedding new technologies with conventional investigative techniques and by prioritizing Customs functions."[45] USCS has taken this approach because workloads along borders have grown substantially (see Figure 8-1). For example, along the southwest border in FY 98, 3.5 million trucks, 75 million cars, and 254 million people crossed while USCS has only 1,800 inspection personnel at the border.

A two-year old drug interdiction program called Operation HARD LINE was designed to permanently harden Southwest Border ports of entry against drug smugglers. Due to the program port running decreased by almost 60%. In addition, drug seizures increased substantially in FY 1996; narcotics seizures increased 29% by total number of incidents (6,956 seizures) and 24% by total weight (545,922 pounds of marijuana, 33,308 pounds of cocaine, and 459 pounds of heroin) when compared to FY 1995 totals. The total weight of narcotics seizures in commercial cargo on the U.S. - Mexico border in FY 1996 were up over 153% (56 seizures totaling 39,741 pounds) when compared to FY 95 seizure statistics. This increase in narcotics seizures is due to an increase in the number of intensified inspections and tactical intelligence resulting from Operation HARD LINE.[46] ACE will assist Operation HARD LINE by providing USCS personnel with better data and improved compliance allowing personnel to concentrate on greater interdiction.

[44] ibid
[45] Data provided by the United States Customs Service at www.customs.ustreas.gov/enforcem/hardline/intfact.htm
[46] ibid

Table 8-3: Economic Costs of Drug Abuse in the United States, 1992[47] (Millions $)

	Economic Costs
Health Care Expenditures	
Drug abuse services	$4,400
Medical consequences	$5,531
Subtotal Health Care Expenditures:	**$9,931**
Productivity Effects (Lost Earnings)	
Premature death	$14,575
Impaired productivity	$14,205
Institutionalized population	$1,477
Incarceration	$17,907
Crime careers	$19,198
Victims of crime	$2,059
Subtotal Productivity Effects:	**$69,421**
Other Effects on Society	
Crime	$17,970
Social welfare administration	$337
Subtotal Other Effects on Society:	**$18,307**
Total Economic Costs	**$97,659**

Not all of the economic costs associated with drug abuse would decline as a function of an increased drug interdiction and decreased in-flow of drugs across borders, e.g. spending for drug interdiction and law enforcement. However, large portions of the economic costs of drug abuse such as health care costs and productivity effects can be expected to decline with reduced availability and hence reduced consumption of illegal drugs due to improved compliance facilitated by ACE.

The exact amount of societal benefits can only be estimated. A one-percent reduction in drug in-flows will not necessarily result in a one-percent reduction in economic costs. A portion of the drugs consumed in the US is produced domestically and reduced availability of certain drugs may lead to substitution with drugs that are more readily available. However, even a 0.1 percent decrease in the economic costs of drug abuse could represent an overall cost saving to society in excess of $100 million per year.

Estimation Approach

To calculate the ACE societal benefits, it is necessary to estimate current drug related economic costs (see Table 8-3) and the potential impact ACE may have reducing the flow of drugs into the country. (Refer to the external benefits section of Appendix G for a discussion of assumptions and data.) The following formula is used to calculate societal benefits (see Table 8-4 for external benefits analysis results):

Societal Benefits = *Annual Drug Related Economic Costs * Cost Reduction Factor * Participation Factor*

[47] National Institute on Drug Abuse, "The Economic Costs of Alcohol and Drug Abuse in the United States – 1992" and "Updated Cost Estimates: 1992 Estimates and Inflation and Population-Adjusted Costs of Alcohol and Drug Abuse for 1995"

Key Benefit Drivers

The primary factors driving societal benefits are current drug related economic costs, the cost reduction factor, and the participation factor (i.e., implementation period). The uncertainty surrounding each of these factors is considered as part of the risk and sensitivity analysis in Section 9.

8.2.3 Quantifiable External Benefits Results

The results of the external benefits analysis are presented in Table 8-4. The benefits are calculated using the formulae presented in this section and the data presented in Appendix G. As the table shows, total external benefits in millions of discounted dollars for ACE are estimated to be $1,879. Relative to the total trade community and drug related costs over the 22-year analysis period, the benefits reported below represent a small fraction of total public and private expenditures. Trade community benefits are 52% of the total and societal benefits are 48%. Also, in relation to the total life cycle ACE benefits, external benefits represent 37% of the total.

Table 8-4: External Benefits Results

External Benefit Category	ACE 4-Year Deployment
External Analysis Results	
Trade Community (PV $M)	$973
Societal (PV $M)	$906
Total ACE External Benefits (PV $M)	**$1,879**

The following figures present the basis for the ACE external benefit results reported in Table 8-4. In Figure 8-2, ACE reduces filing and liquidation costs of the trade community by conforming to the Mod Act. Since ACS does not achieve functionality defined by the Mod Act or any other new functionality, such benefits do not accrue to ACS. The area between the two curves represents the benefits attributable to ACE.

Figure 8-2: ACE Trade Community Benefits

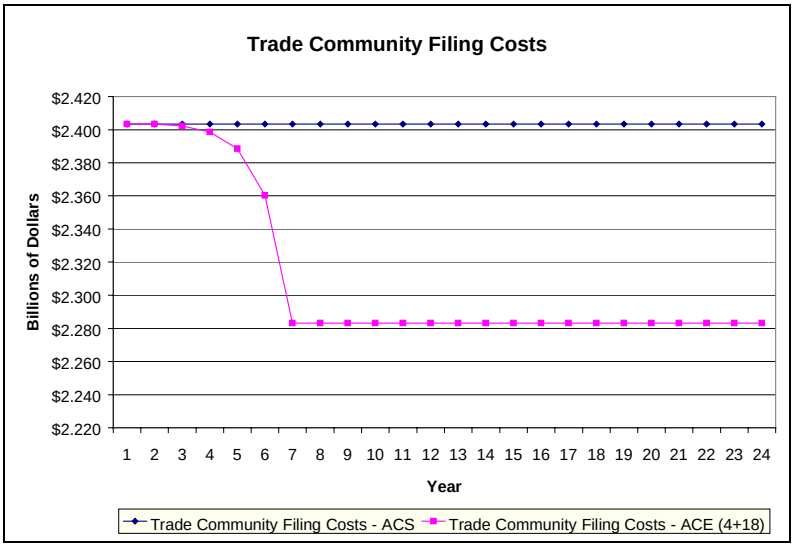
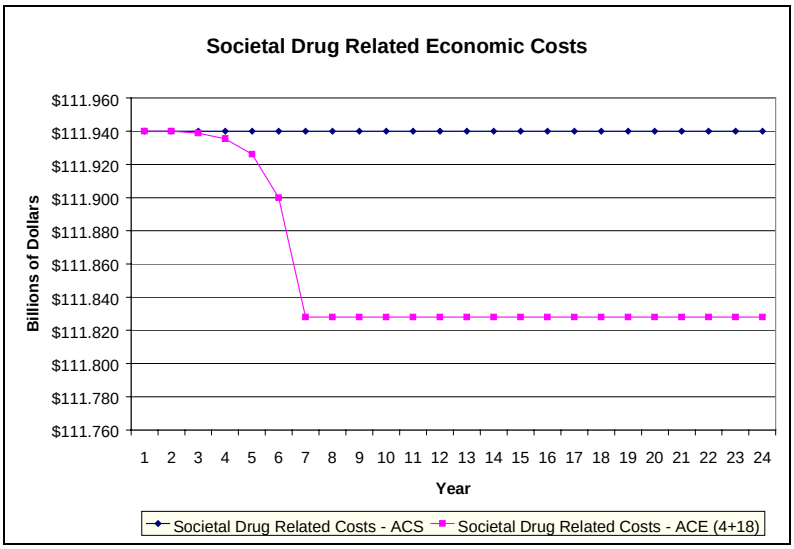


Figure 8-3 shows how under ACE, drug interdiction increases thereby reducing the drug related economic costs to society. In contrast, with ACS there is no such improvement. The difference between the two curves represents the benefits attributable to ACE.

Figure 8-3: ACE Societal Benefits



8.3 Non-Quantifiable External Benefits

There are a number of non-quantifiable benefits in addition to the quantifiable external benefits of ACE. For example, ACE allows remote filing for private firms to consolidate operations anywhere in the country. This and other impacts while not readily quantified with available data are important and likely significant. Each of the non-quantifiable external benefits, trade community and societal, are discussed in the following subsections.

8.3.1 Trade Community Non-quantifiable Benefits

The trade community will benefit in a number of areas that are difficult to quantify but nonetheless confer significant benefits to the trade community and the economy as a whole. Some of the anticipated non-quantifiable benefits to the trade community are described in Table 8-5.

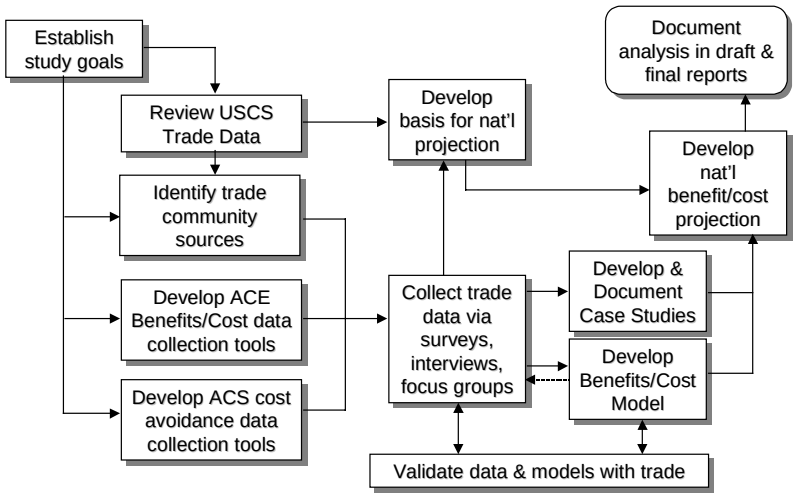
Table 8-5. Potential Benefits of ACE to the Trade Community

Broker Benefits	Importer Benefits	Carrier Benefits
• Provides nationwide service from central location • Less effort to file entry summaries and make payments	• Manages import activities on a national basis • Consistent information for decision making • Capability to reconcile value, classification, NAFTA, and 9802 issues	• Less effort to move cargo through Customs • Faster release at Customs • Reduced effort to file documents with Customs

This subsection identifies and describes anticipated benefits and associated costs to the trade community, including importers and shippers (manufacturers, distributors, etc.), carriers (air, rail, motor carrier, marine, couriers), and agents (customs brokers, expeditors, freight forwarders, bonding agencies, surety agencies, etc.). This qualitative analysis supports the findings in Section 8.1.

The data collection and analysis approach was designed to obtain the best possible information from the trade community. Data and analytical approaches were presented to members of the trade community to ensure that the study team had accurately portrayed the opinions and concerns.

Figure 8-4: External Benefits Study Approach



During interviews and in the survey questionnaires, ACE functionality and cost avoidance (due to ACS downtime and recovery) benefits were grouped under four major headings:

- *Direct Cost Reduction*—Benefits achieved through reductions in direct cost such as labor, materials, handling, courier services, etc. resulting from paperless processes, increased system reliability (compared to ACS), and greater functionality.

- *Increased Compliance*—Benefits achieved through increased compliance that lead to reduction or elimination of corrective actions, cargo examinations, audits, penalties, investigations, and other actions related to non-compliance.

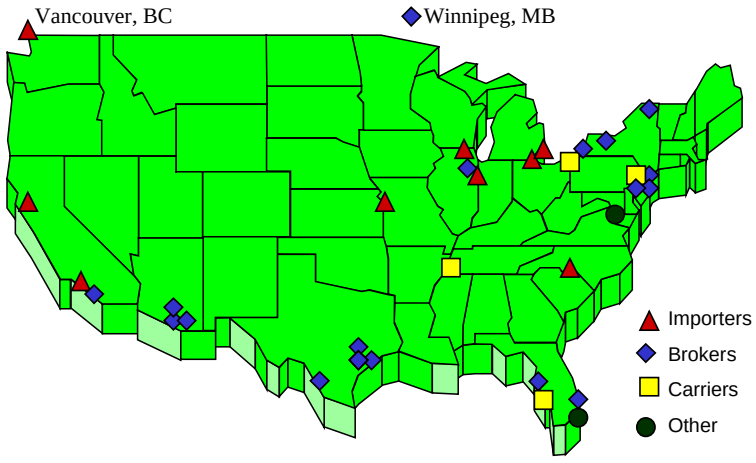
- *Logistics Improvement*—Benefits that result in increasing the predictability of cargo movements across the border and fewer and shorter delays at the border achieved through expedited processing.

- *Trade Data Integrity*—Benefits that result in better trade data to support trade decisions by individual importers, more informed trade negotiations by trade representatives, and better assessment of trade compliance.

The analytical framework provided structure to the information gathering task by moving from the more concrete (direct cost reduction) to the more abstract (data integrity). Although the information gathered on direct cost reduction contain some quantitative estimates which can be extended to larger segments of the trade community, the greater benefits may well fall in the more abstract areas where benefits are discussed in more qualitative terms.

A variety of information gathering techniques were used in the effort to define and characterize external benefits. These techniques included personal interviews, teleconference interviews, group interviews conducted via teleconference calls, and short sets of written questions sent out to broker organizations and Trade Support Network (TSN) members and returned via fax. This group of importers, brokers, carriers, and others in the trade community included major international trade partners located in the U.S. and Canada, as shown in Figure 8-5. A profile of the data series is provided in the subsequent section.

Figure 8-5: Locations of Trade Data Sources



Approximately forty members of the trade community provided data, either through direct communication with the study team or through the TSN representatives. Upon receipt,

questionnaires were evaluated and entered into a database for further analysis. Throughout the trade community there was reluctance to estimate direct dollar savings due to either proprietary issues or simply their inability to predict the effect ACE functions would have on their businesses until those functions are implemented.

The questions asked in the Trade Benefits Questionnaire are organized around the areas where benefits will occur. They address benefits that accrue due to the improved functionality of ACE as well as benefits derived from improved reliability over the current ACS. Consequently, respondents were asked to estimate the effects of ACE functionality over that currently available through ACS.

Respondents were instructed to make the following assumptions in answering the questions concerning ACE:

- All entry and entry summary-related information is submitted and received electronically from anywhere in the country.
- The trade community will be able to make a large variety of electronic corrections to entry summary data.
- Status information about individual entries is electronically accessible to the importer or broker from anywhere in the country throughout the entire entry process from filing through liquidation.
- Duties, taxes, and fees are paid to USCS on a national and periodic (e.g., semi-monthly) basis (in contrast, the current method requires payments within 10 days on a port-by-port, transaction-by-transaction basis).
- Importers and brokers have electronic access to consolidated account information to assist in managing import activities in the aggregate.
- USCS uniformity improvements achieved through national databases result in fewer duplicate requests for information, requests for samples, and cargo examinations.
- Data required by USCS for entry purposes is compatible with data used in private industry business practices.

As mentioned earlier, the members of the trade community contacted representative samples from throughout the trade community. Table 8-2 depicts the variety of trade members contacted in this effort. In addition to those shown in Table 8-2, a representative of the American Association of Importers and Exporters was interviewed as was a representative of surety firms.

Table 8-6: Trade Community Members Contacted for ACE Benefits Data[48]

(Companies in **bold type** responded to surveys or participated in interviews.)

Brokers	Importers	Carriers
Tier 1 (Top 25) **Tower Group** • **Buffalo** • **Detroit** • Los Angeles **Livingston** **PBB Global**	**Top 1000** **Daimler-Chrysler** **General Motors** **Levi Strauss** **Mattel** **Robert Bosch** **Sara Lee**	**Land** *Highway:* **Penske Logistics** Verspeeten Cartage *Rail:* Canadian National Canadian Pacific *Courier:* **Federal Express**
Tier 2 (26 – 150) **C.H.Robinson** **Casas Int'l** **Danzas Corp** **GHY USA, Inc** **Hastings** **Pacific** **Shannon Brokerage Co.** **William F. Joffroy, Inc.**	**Next 6200** **Kyocera Industrial Ceramics** **Hallmark Cards**	**Sea** **Hanjin Shipping** **Lykes Limited**
Tier 3 (remainder) **Camelot Company** **Feinstein & Norris** **H.Z. Bernstein Co., Inc.** **John F. Kilroy Co., Inc.** **NY Freight Forwarders** **Triple-A Brokerage, Inc.** **W.R. Zanes** **World Exchange**	**Remainder** **Fastall Corporation** **Manildra Milling** **Tilden Corporation** **Wells Lamont**	**Air** Northwest Japan Air *Courier:* **Federal Express**

Customs Brokers

Within the trade community, Customs brokers will interact with and be affected most by ACE. These service providers perform a variety of tasks including preparation of entry documents and entry summaries; payment of duties, taxes, and fees; and error corrections on documents; and they serve as liaisons between the importers and USCS at the port to assist in moving goods through USCS. All of these functions are critical to moving products and materials into the U.S. and on to their place of consumption, either in the U.S. or another country. In general, brokers interact mostly with ACS and can best assess how ACE will affect data flows to USCS for the purpose of cargo release into or through the U.S. For the purposes of this study, brokers were grouped as follows: Tier 1 represents the top 25 brokers in terms of value of goods handled; Tier 2 represents the next 125 brokers; and Tier 3, which accounts for the remaining brokers. According to statistics provided by USCS, the Top 25 brokers account for approximately 60% of

[48] The grouping of importers and brokers are based on classifications provided by U.S. Customs Service.

all entries filed yearly, with the next group of 125 brokers accounting for an approximately 18% more. Small brokers account for the remaining 22% of entries filed. At least three representatives from each group were interviewed telephonically or through questionnaires.

Importers

USCS categorizes the more than 320,000 importers into three major groups based on the approximate value of the goods imported. The top tier of importers is referred to as the "Top 1000," and accounts for about 60% of the total value of all goods entering the U.S. on an annual basis. The second tier includes approximately the next 6,200 importers and accounts for 20% more of the total value of entering goods. The remaining 310,000+ importers account for the remaining 20% of the value of goods imported. This tier represents many importers who import goods once or twice a year. The small importers that import infrequently will realize little, if any value from ACE because they have such little direct contact with USCS. Most of these importers will contract with a broker to help them comply with USCS requirements and any contact with USCS will be through the broker.

Figure 8-6: Profile of 1997 Importers

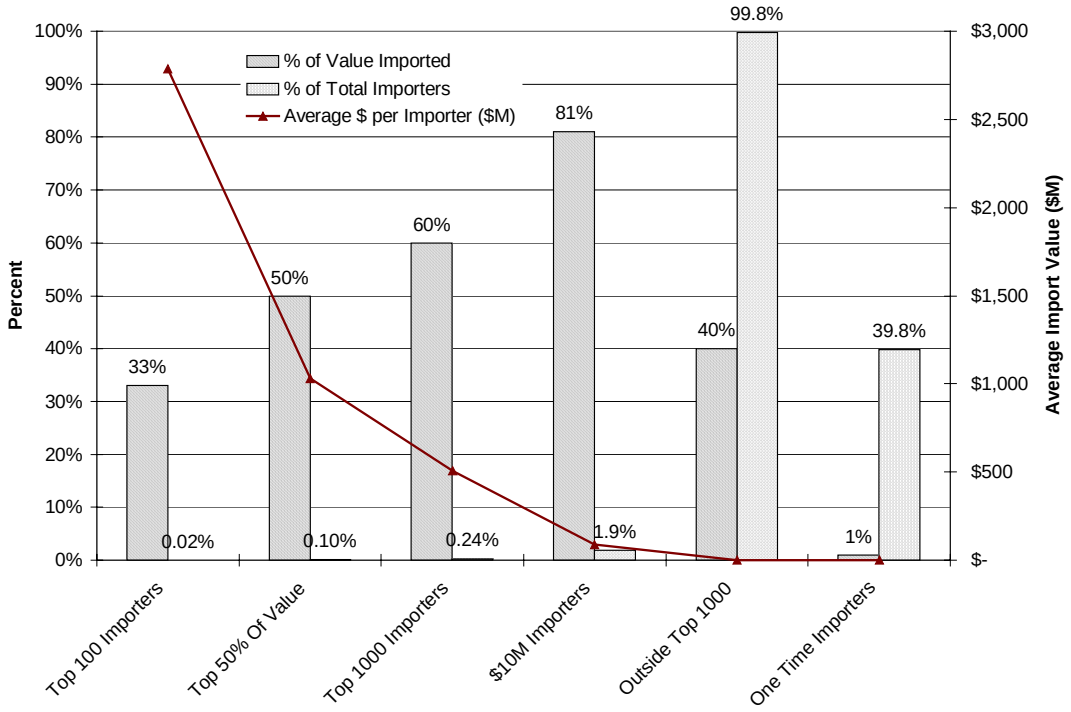


Figure 8-6 shows relationships between the number of importers, the total value of imports, and the average value per importer in each category. Note that the top 100 importers average goods valued at nearly $3 billion while the outside top 1000 importers import about $1 million each and represent 99.8% of all importers and 40% of the value imported. Note also that nearly 40% of the importers are one-time importers (also included in the outside top 1000 category).

Interviews with importers focused on companies who had the most familiarity with NCAP, the ACE prototype, or with the development of the ACE concept through the TSN.

Carriers

Carriers interact with the USCS primarily through the presentation of shipping manifests for their trucks, trains, vessels, or airplanes. For air, sea, and rail conveyances, USCS has already developed the Automated Manifest System (AMS). This system provides these transportation providers with the means of electronically providing USCS with manifests as soon as they initiate their journey. Because there is normally sufficient lead time before the conveyance arrives at an U.S. port of entry, USCS has time to review the information provided and determine the release status of these shipments prior to arrival. Due to the almost real-time nature of the trucking industry at land border ports, pre-clearance is generally not available for this group of carriers. ACE could have the greatest effect on this group of carriers since they will be able to provide USCS with advance notice of their arrival. In addition, ACE is envisioned to integrate the existing manifest systems. This will assist those carriers whose business line covers multiple modes of transportation by providing them with a single manifest system and uniform business rules.

Trade Support Network

The TSN was created with representatives from the major international trade associations. The Trade Support Network was established and the membership selected to represent a broad segment of the various trade organizations and associations with which USCS does business. The TSN serves as a sounding board for issues and ideas generated by the ACE team and as a source of trade community requirements for the new system. The ACE team communicates with the network via conference calls, local visits, national conferences, electronic mail, sharing of prototypes, and, potentially, videoconferences.

Members of the TSN were selected for interviews because of their familiarity with the development of ACE and its planned characteristics. Other members of the TSN were contacted by USCS Account Managers and Client Representatives and asked to provide information via the questionnaires.

8.3.2 Non-quantifiable Trade Community Benefit Findings

This section includes consolidated results of all interviews, meetings, and surveys. The findings are reported two ways: first, by trade community element; second, by trade benefit area. Direct quotes from meetings, interviews, and surveys are included in this section, but in keeping with non-attribution agreements with trade participants, no references to specific contributors are made.

Tier 1 Brokers (Top 25)

Primary Benefits—Tier 1 brokers are familiar with the general concept of ACE and are particularly enthusiastic about several of the proposed functionalities of ACE. It should be noted that some larger importers and brokers participate in pilot programs with USCS to evaluate ideas

> ***"We pray to the ACE god every day to rescue us from ACS."***
>
> - Tier 1 Broker

such as periodic payments, remote location filing, and consolidated entry documents. Some Tier 1 brokers that participate in or observe these pilot programs are now certain that their businesses will change significantly upon full implementation of ACE. Brokers agree that periodic payments will save staff time in the preparation of entry summaries and in the submission of the single payment that would accompany the entry summary. The promise of a single account for an importer that allows a broker to make one national payment no matter how many physical ports of entry are used by that importer is also viewed as a key benefit of ACE. In conjunction with the consolidated national account, the ability to do "remote location filing" will also allow brokers to consolidate operations into one or two key locations. Brokers believe that, by creating a national system for USCS to share information more readily among their ports of entry, there will be more uniformity in the way the same product is treated at different ports. Finally, the ability to communicate electronically with USCS in conducting reconciliation is viewed as a time-saver for accounts that have compliance problems.

Anticipated Investments—Many of the brokers have already made significant investments in upgrading business systems to communicate electronically with USCS and their customers. Most brokers handle a variety of entries and the development of the ABI and the AMS for rail, sea, and air entries has already caused them to make significant investments. Using only preliminary information about ACE requirements, brokers' estimates for software conversion, hardware purchases, training, and normal maintenance, ranged from less than $100,000 to approximately $3 million. However, most respondents acknowledged that their figure was a very preliminary guess.

Concerns Expressed—Almost all brokers expressed concerns over the time planned for the development of ACE. Many felt that even a four-year development cycle may be too slow to keep pace with the computer industry and that by the time the system requirements are defined, the hardware will be outdated. One suggestion is to deploy ACE in an incremental modular manner, offering high-pay-off functionality as early as possible. The other major concern expressed was that the current ACS would not be able to support the volume of trade traffic and will collapse without warning. While an ACS collapse would significantly affect the way USCS does business, most brokers felt that they would print their entries rather than transmit them electronically and then hand deliver them to Customs. The burden would then be on Customs to process those entries. The view of the effect of ACS failure on the flow of commerce ranged from completely stopping the flow of goods to Customs allowing goods to enter the U.S. as rapidly as possible and then catching up using overtime and staff augmentation. Some brokers noted that they have now started to budget overtime into their annual budgets in anticipation of ACS going down for periods of time.

Illustrative Comment – "It is unrealistic to expect that brokers will ever get to a totally paperless environment"

Tier 2 Brokers

Primary Benefits—For the Tier 2 brokers interviewed, raising importer compliance rates is more of a pay-off than for the larger brokers because of the labor-intensive activities that go into correcting problems. For brokers serving customers with very tight "just-in-time" schedules the ability to clear entries rapidly and with high compliance rates is critical to staying in business. Importers will switch brokers if deliveries are delayed due to broker errors since there are penalties and incentives associated with their business. The ACE system should reduce simple "data entry" errors and speed deliveries to customers/assembly plants. The periodic payment process of ACE may be more critical to the Tier 2 brokers, depending on the payment arrangements they have negotiated with importers. The periodic payments also allow brokers to review entry summaries more closely to ensure accuracy.

> ***"ACE is more than just an electronic system, it is a state-of-the-art philosophical approach to doing business that is needed for the entire country."***
>
> -Tier 2 Broker

Anticipated Investments—The Tier 2 and Tier 3 brokers have not invested as heavily in automating their processes and continue to handle many entries with paper entry documents.

Concerns Expressed—For those brokers handling fresh produce and other time sensitive goods, the system used to clear entries must be reliable. For the most part, they feel that for ocean, air, and rail entries, ACS is working well when they can get their entries to Customs eight hours or more before arrival. Truck shipments pose a more significant challenge. With the increase in ACS downtime, they fear that ACS is rapidly becoming obsolete, and ACE is their only hope. Like Tier 1 brokers, they are concerned with the time planned for ACE development. Modular deployment was suggested. Another suggestion from this group to help ensure that ACE does not suffer from trying to process too much data at the same time is to divide ACE inputs into the "live" data (data contained in the 3461 that is needed to clear the cargo) from the "dead" data (data from the 7501) and use separate channels to transmit it. They also felt that it would be beneficial to all concerned if USCS can offer training sessions on how to classify products and where the necessary information will be in the system to make classification easier.

Illustrative Comments – "ACE will dramatically change the role of the broker." "Technology can provide a 'level playing field' for all brokers."

Tier 3 Brokers

Primary Benefits—The Tier 3 brokers participating in this effort echoed many of the thoughts of the larger brokers, however in many ways they feel that ACS is proving adequate for their work and are not able to articulate large benefits from moving to a new system. They believed that the consolidated billing and remote location filing will help "level the playing field" for the smaller brokers and give them a chance to

> ***"Uniformity among ports will be a big plus."***
>
> -Tier 3 Broker

compete in larger markets. Periodic filing could save two to three staff-days every two weeks and that means a great resource savings for the small broker. Also, the greater visibility into the classification process will help them since their staff has to be familiar with all aspects of the entry process. They cannot afford to have staff who specialize in one particular aspect of the process.

Anticipated Investments—These brokers hope that system hardware requirements will not be significantly different from what is needed now to interface with ACS. They anticipate using commercially available software that will be designed by larger brokers or third party vendors and made available for purchase.

Concerns Expressed—While these brokers recognize the potential value of ACE, especially in allowing them to compete with larger firms, they have less flexibility to accommodate significant changes in ACE functionality and system requirements that affect their investments and business processes. They also expressed concern for how long it will take to get the system operational.

Importers

Primary Benefits—Some of the largest importers interviewed felt that their greatest benefit from the planned implementation of ACE will come from increasing their compliance rates. The perception of the benefit accrued from increased compliance was attributed to two factors. The importers recognize that their compliance rate is a major factor in the Customs decision process for determining which shipments to inspect upon entry to the U.S. This can be critical for importers obtaining the release of their merchandise to enable them to maintain their "just-in-time" supply chains, e.g. in the automobile industry. Discussions with USCS officials indicate that account-based importers with low compliance rates are much more likely to be selected for a compliance inspection than an account-based importer with a high compliance rate.[49]

> ***"Let's stop talking about ACE, and start developing it."***
>
> -Importer

The other aspect of increasing their compliance rates is attributed to the understanding that ACE will provide importers and brokers with increased visibility into the classification process, which will provide time and resource savings by speeding and, hopefully allowing for automation of, the classification process. This would in turn lead to fewer reconciliations and reclassifications, which also reduces the time and resources expended by the importer or broker. ACE will also allow importers to take further advantage of the electronic transmission of orders and shipping information that many importers have already implemented through technology enhancements. With reduced data requirements and the movement to an almost paperless environment, most importers believe that there will be significant savings in the preparation of Customs documents and that relationships with brokers will be significantly changed. Another important benefit of ACE cited by importers is remote location filing, which will allow most importers who use brokers to consolidate operations and file entries from a single strategic location. This consolidation offers opportunities to reduce personnel

[49] U. S. Customs Service *FY1997 Trade Compliance Measurement Report* classifies account-based importers as follows: Low Risk -- 90% compliance, Moderate Risk – 88% compliance, High Risk – 80% compliance. The report further states "that higher risk leads to more examinations." (page 4)

requirements and eliminate redundant activities at import entry locations throughout the U.S. This opportunity is further enhanced by ACE's periodic entry summary filing requirement rather than the current daily requirement. With a requirement to file consolidated entry summaries and payments periodically, importers believe that there will be "significant savings," but they are unable to quantify that statement until they have some experience under the new system.

Anticipated Investments—The importers interviewed for this analysis believe that modernizing the flow of information to take advantage of new technology is not an option, but a necessity in today's business environment. They have automated their processes to capture data from the time an order is placed until their product is delivered. They view paperless entries to USCS as a natural extension of the way they already do business. The importers participating in the NCAP prototype report that they have made investments ranging between two and three million dollars. These investments have been justified to their management based on the anticipated savings that will result from higher compliance rates and savings that will result from faster and more accurate submission of entry data required by USCS.

Concerns Expressed—Importers, like the broker community, are concerned about the length of time it is taking to get a new system in place. While most importers acknowledge that ACS has worked fairly well in the past by modernizing some of their entry submissions, they are concerned that ACS will not be able to handle the volume of imports that have resulted from the implementation of NAFTA and other trade initiatives. They are not sure that ACS can last the four or seven years it will take to develop ACE.

Carriers

Primary Benefits—Only one segment of the carrier community believes that their way of doing business will be affected by the implementation of ACE, and that is the highway trucking firms. The sea carriers who participated in this study indicated that they have been using the USCS AMS for a number of years and it has allowed them deal with USCS in a paperless environment.[50] One trucking firm involved in the NCAP prototype reported that they have seen a significant decrease in time spent processing at the port of entry. They now estimate that vehicles that are part of the NCAP program have experienced about a 45 minute reduction in waiting time at the port of entry. This is in comparison to vehicles that can not participate in the line release program or who have more than three line release commodities to be transported. Those vehicles must park and wait in line to present documents to Customs Inspectors to be released into the U.S. Depending upon how trucking companies compensate drivers for their waiting time at ports of entry, this could translate into substantial savings for companies if ACE shows similar time savings. Additionally, the lost productivity of trucks delayed at USCS is an opportunity cost to the trade community.[51]

Anticipated Investments—Trucking firms participating in NCAP have not had to make significant investments to date, primarily because the number of participating vehicles is a small part—less than 10%—of their number of vehicles crossing the border. They were not able to

[50] The exception to the paperless release is the paper bond document required by USCS.
[51] Previous U.S. Customs studies of the value of the Line Release program estimate the opportunity cost of trucks delayed during Customs processing to be between $35 and $80 per hour.

project any investment costs if ACE is implemented. Those air and sea carriers participating in the AMS programs reported that there were substantial investments that occurred as a normal part of the company's modernization, and were unable to provide, what the costs were that would be attributed to moving to the AMS environment.

Concerns Expressed—The main concerns expressed by this segment of the trade community is that as ACE is developed, Customs keep in mind that the AMS is already in existence and that minimal changes be required for legacy systems. They feel AMS meets their needs and see no reason to modify their systems to comply with a system that does not affect them.

Others

Representatives of other members of the trade community were interviewed whenever possible, but their responses continued the theme of not knowing enough about the planned ACE functionalities to be able to provide much insight. A representative of the surety industry expressed concern that the current ACE prototypes do not address the requirement of the Mod Act to create an "automated surety interface." While the ultimate design of ACE will provide such an interface, this individual had hoped that USCS would move faster on this initiative in an effort to realize projected benefits. The surety industry feels that automating their segment of the movement of goods would provide benefits to USCS as well as to them by providing more time sensitive information about the bonds that are in place and whether or not the amount of the bonds are sufficient. A representative of the courier industry expressed hope that ACE will be able to handle greater volumes at faster speeds because of their concern that ACS is fast approaching its maximum capacity. It seems that their view echoes what was heard from most members of the entire community, that ACS was a good system for its time, but it needs to be replaced as soon as possible.

8.3.2.1 Non-Quantifiable Benefits by Trade Benefit Area

The findings reported in this section reflect the aggregation of results across all segments of the trade community from which data and comments were obtained. Many of the findings are based on responses to the survey questions; others are drawn from interviews and other USCS documents.

A total of thirteen survey questionnaires distributed to the trade community were returned. Since the survey questionnaires were distributed through multiple methods (TSN, USCS Account Managers, and Client Representatives) and were further distributed within the trade community by the trade contacts themselves, the exact number of questionnaires distributed is not known. However, every member of the trade community known to have received the questionnaire was contacted multiple times to solicit a response and answer questions. In some cases, a second questionnaire was sent.

Direct Cost Reduction

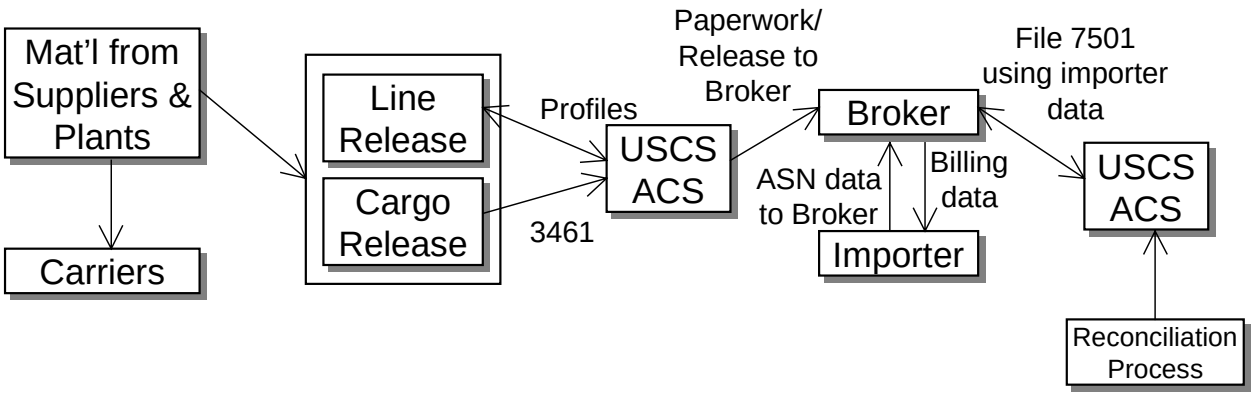
The direct cost reduction benefits associated with ACE deployment fall into five primary areas:

- Staff time saved in preparing and submitting ABI entries and entry summaries;

- Staff time saved in preparing and submitting payments of duties, taxes, and fees;
- Staff time saved in researching and resolving post-entry summary discrepancies;
- Staff time saved by eliminating paper documents (e.g., paper entries, quota entries, NAFTA entries, OGA documents); and
- Staff time saved by avoiding ACS downtime due to system overload or failure.

Of these five areas, the first two are the frequently recurring activities since every entry requires cargo release information, an entry summary, and payment of applicable duties, taxes, and fees. The savings associated with ACE result from better access to information about the status of an entry, more timely notification of discrepancies or other problems, and consolidation of entry filing and periodic payments. These savings accrue to different segments of the trade community, depending on the business model used by the importer, broker, and carrier. In some cases, the business model enabled by ACE will change the business relationships (e.g., between suppliers, importers, brokers, carriers, surety firms, etc.) by reducing or eliminating some activities and making other activities less complex. This is best illustrated by one importer's high level view of the "As Is" and "To Be" business models. Figure 8-4 shows the "As Is" process. In this model, the importer is largely unaware of the status of shipments until the shipment arrives at the importer's facility. Further, the importer has no way of knowing which, if any, shipments are non-compliant or encounter other problems during the importation process since the broker assumes responsibility for filing the entry, resolving entry problems, and, in many cases, paying duties, taxes, and fees on behalf of the importer.

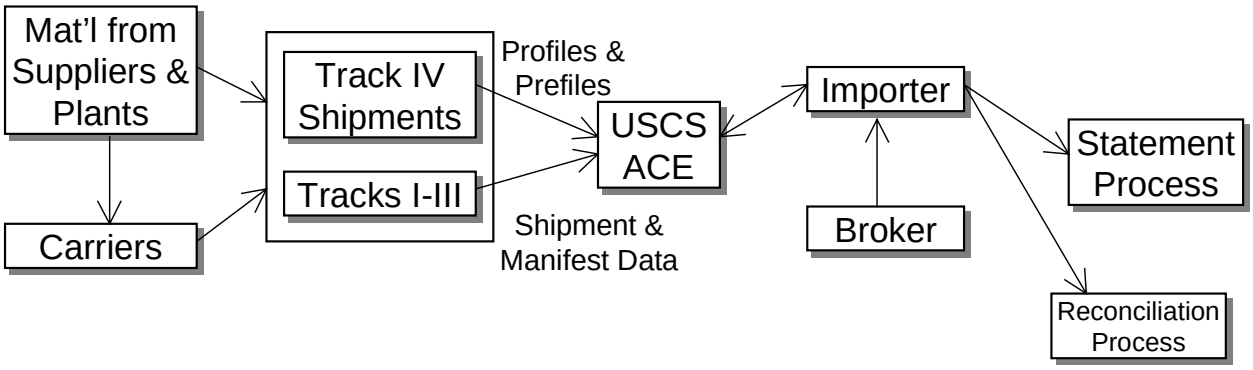
Figure 8-7: "As Is" Process for Entry Information Flow



In contrast to Figure 8-7, Figure 8-8 shows the "To Be" process following full deployment of ACE. Note that the major difference is the role of the broker. In Figure 8-4, because of the complexity of the process and the greater possibility of error, a broker handles routine entry transactions. Because of automation, ACE allows importers to integrate entry filing into primary business systems. All of the information needed to file an entry is available electronically from existing databases. The carrier is able to link a vehicle and driver to specific entries and transmit that data to USCS prior to the arrival of the vehicle, much as is done under AMS for air, rail, and sea carriers. The entry is reviewed automatically by ACE while the shipment is in transit so that

information needed to make a release decision is available to primary inspectors prior to arrival. Further, the importer can link directly to USCS systems and have visibility into the status of entries, including any discrepancies in the entry information. One importer estimated an expected savings of 70% in brokerage fees due to this change in business practices.

Figure 8-8: "To Be" Process after ACE Deployment



Most likely, only the largest importers will consider filing their own entries directly with USCS. Brokers will continue to serve the majority of importers, including some of the largest. One large importer interviewed indicated that they would continue to use a Customs broker but they expect the broker's costs to decrease and anticipate that competition among brokers will cause this savings to be passed along to importers. All of the importers interviewed acknowledged the importance of the broker in the import process but felt that the role of the broker will probably evolve under ACE, especially for the large importers.

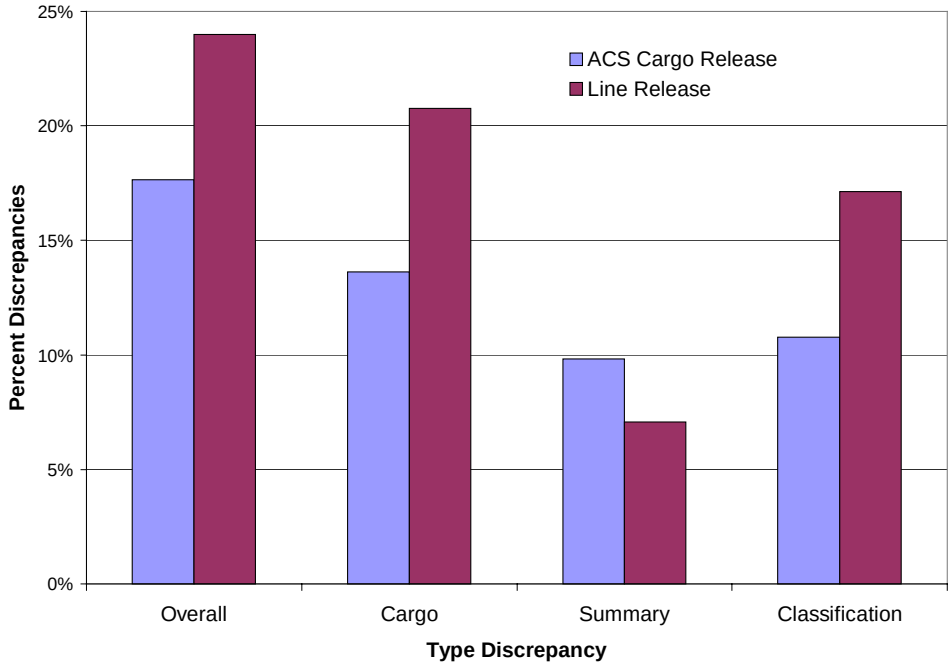
The major area where importers and brokers are likely to experience cost savings is in payment of duties, taxes, and fees. USCS is currently evaluating the semi-monthly payment process and has received comments from several of the prototype system users. Importers and filers evaluating semi-monthly statements generally favor it over the "within 10 days" method currently in use and estimate savings from 15-20 minutes per day to 20 hours per month as a result of semi-monthly processing.

Increased Compliance

Several of the importers interviewed indicated that increased compliance will be the single greatest benefit they realize from ACE implementation. As mentioned above, under ACS, most importers do not know the status of their entries and often do not know their historical compliance rates since non-compliance problems (e.g., misclassification) are generally resolved by the filer (broker) on behalf of the importer. The value of increased compliance depends on two factors: (1) an importer's historical compliance rate and (2) the effect of non-compliance on cargo movement.

Some importers and filers interviewed indicated that their compliance rates were very high (98% or more) and that they anticipate little increase in compliance due to ACE. To put this in perspective, Figure 8-9 shows percent discrepancies by discrepancy type and method of release for 1997 imports.

Figure 8-9: Percent Discrepancies by Discrepancy Type



As shown in Figure 8-9, the overall discrepancy rate is about 18% for ACS cargo release and nearly 24% for line release. Most of the discrepancies are classification errors and more are found in cargo release than in the entry summary.

Although the sample size is small, the NCAP participant's experience indicates dramatic reduction in discrepancies for NCAP shipments.

Logistics Improvements

Improvements in the area of logistics are largely speculative on the part of importers and carriers. One of the carriers interviewed was participating in the NCAP prototype and estimated that the vehicles being used in NCAP were saving approximately 45 minutes over those trucks that were not in NCAP. While this particular carrier was not attempting to translate that savings into more round-trips for the fleet, the time savings was recognized as one that could result in more efficient use of the vehicle fleet. This time savings at the border did give the carrier more confidence that it would meet its delivery schedule. This particular fleet only had one delivery that had to meet a specific time-slot for off-loading, so it was not as time critical as some schedules could be. Nevertheless, importers participating in the NCAP prototype were pleased that this large variable in their "just-in-time" supply chain had been greatly reduced and could now be predicted more accurately.

Trade Data Integrity

This category of benefits that would accrue from the implementation of ACE is very difficult to define and measure when the system has not been fully defined. However, nearly all parties who

were interviewed believed that the one-time nature of data input into a highly automated system will naturally result in more accurate and timely trade data. When fewer people are involved in entering the same data, fewer mistakes are expected. With more accurate and timely data available, brokers and importers will have better visibility into such things as quotas and other restrictions. This, in turn, allows brokers and importers to plan goods movement to minimize the delay of the merchandise at the port of entry. Further, the data editing capability available through ACE should also ensure that brokers, importers, and USCS personnel have greater opportunity to identify and correct data errors as early and easily as possible. Table 8-7, below, summarizes the benefits to the trade community of implementing ACE.

Table 8-7: Summary of Trade Benefits

	Importers	Brokers	Carriers	Other
Direct Cost Reduction	• Semi-monthly payments save time in entry summary prep & payment prep • Remote location filing allows consolidation of assets • Periodic filing saves a large importer almost one week of data entry every 2 weeks • One large importer expects a 70% reduction in broker fees	• Semi-monthly payments save time in entry summary prep & payment prep – one small broker estimated 2 staff days saved every 2 weeks • Remote location filing allows consolidation of assets • Paper-intensive brokers expect 40 – 60% time savings on entry filing	• Reduced payments to drivers for waiting time at POE – northern border pays $8/hr spent waiting	• Surety companies have more visibility into bond writing & performance of companies being insured
Increased Compliance	• Fewer shipments examined (Importer with low compliance rate is almost 16 time more likely to be inspected.) • Easier for staff to classify goods • Fewer reclassifications to prepare • Estimated $300 savings for each exam avoided	• Easier for staff to classify goods • Fewer reclassifications to prepare • Fewer changes to already paid fees • Savings of $200 - $700 for each exam avoided	• Less time spent at POE	• Fewer bond payments
Logistics Improvement	• More predictable scheduling • More reliable deliveries		• Expect as much as 45 minute time savings at POE • Allows increased utilization of vehicles as turn-around time decreases	
Trade Data Integrity	• Better visibility on quotas or other restrictions • More accessibility to solve classification issues	• Better visibility on quotas or other restrictions • More accessibility to solve classification issues		• More accurate data for trade negotiations with other countries

8.3.3 Conclusions

After interviewing or reviewing written responses from 38 members of the trade community, three themes emerged. The first theme is that importers, brokers, manufacturers, carriers, insurers, and almost any other company associated with the trade community use IT extensively and are modernizing business processes through modern computer and communication technologies. They view USCS as one part of the overall logistics chain, and they want to modernize their systems accordingly. Many companies are waiting for a new Customs system so they can complete this modernization, while other companies are in the midst of modernizing and need to know how they will link to USCS. To these members of the trade community the question is not if USCS will modernize their system, but when will the modernization take place. Several major importers are convinced that they can dramatically change the cost of interacting with USCS, but they cannot estimate the value of such a change until they begin implementing it. The community believes that the way of conducting international trade has changed forever and USCS must become part of the modernized trade process.

A second theme that the community is quick to point out is that the current system, ACS, simply must be replaced as soon as possible. The slowdowns and occasional system downtime have given users a glimpse of what effects a complete system failure would have on their operations. Several importers whose business relies on just-in-time delivery have indicated that the monetary implications are enormous. One importer who manufactures parts for the auto industry indicated that if the auto-maker has to shut an assembly line due to his company's inability to meet delivery schedules, his company has to pay the $100,000 per hour of not operating that assembly line. Consequently, they will go to great lengths to make sure that their manufacturing facility gets the parts needed to produce their product. The community almost unanimously agrees that ACS must be replaced with an advanced, integrated system and they want the U.S. Government to move rapidly so that international trade does not suffer the consequences of failing to replace an outdated and inadequate system.

A third theme is that the trade community is not able to provide specific estimates of savings because ACE has still not been adequately defined to allow them to make those estimates. Some of the items that have been articulated, such as remote location filing and periodic entry summary filing and payment, have been enthusiastically endorsed. Those changes are enough for the trade community to conclude that there will be significant savings when ACE is implemented, and that it may signal a significant change in the way business is conducted.

9 Alternative Comparison

This section compares the costs and benefits of developing and implementing ACE to maintaining ACS. A sensitivity and risk analysis is performed to establish the consequences to the investment decision from changing key input variables. The ACE and ACS base case definitions are summarized below.

- *ACS Base Case*—The ACS base case is the current trade management system funded to maintain the existing level of functionality and performance. The base case does not reflect expenditures related to adding functionality or modifications to business processes required by the Mod Act and other relevant legislation. An evaluation of an enhanced ACS base case containing additional functionality is not possible until ACS is further documented and an assessment is conducted to determine what functionality can realistically be added.

- *ACE Alternative*—The ACE alternative is a system containing the full functionality as established by legislative requirements and intent. It reflects an overall philosophical and operational shift from service port transaction-based workflow and processing to national/account-based workflow and processing. In meeting these requirements, the alternative generates a series of productivity enhancing benefits that accrue to both USCS and the trade community. These productivity gains are not entirely due to improvements in processing speed and reductions in system delays. They also are due to immediate and fundamental improvements in productivity from changing the way in which business is conducted.

The remaining subsections present the sensitivity and risk analysis results. In each subsection, relevant tables and graphics are presented. Technical descriptions of the risk analysis outputs are also provided. The section concludes with a functional comparison between ACS and ACE.

9.1 Sensitivity Analysis

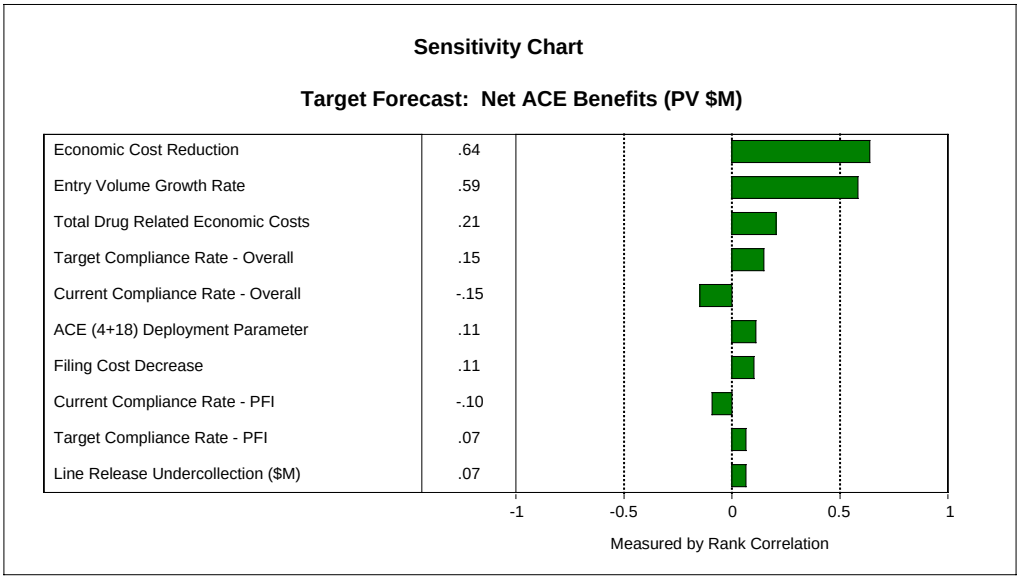
The sensitivity analysis generates two principal outputs: a sensitivity chart and a tornado chart. A sensitivity chart displays the contribution of each input to the uncertainty of an output. For example, the sensitivity chart presented in Figure 9-1 displays the sensitivity rankings of the assumptions in the model. The assumptions (and possibly other intermediate outputs) are listed on the left side, starting with the assumption with the highest sensitivity. The middle column is a listing of rank correlation of the respective assumption.

The assumption with the highest sensitivity ranking can be considered the most important in the analysis. The assumptions with lower sensitivity rankings are less important and can be ignored or discarded altogether (only the top 10 rankings are shown). The figure indicates that the most important inputs associated with Net ACE Benefits (PV $ M) are the assumptions related to trade

volume growth and the economic cost reduction.[52] These are the two principal drivers of internal and external benefits respectively.[53]

The other sensitivity analysis output is the tornado chart. A tornado chart measures the impact of each model variable one at a time on a target forecast. This method differs from the correlation-based sensitivity chart in that the tornado chart tests each assumption independently. While analyzing one variable, the other variables are frozen at their base values. This chart measures the effect each variable has on the forecast while removing the effects of the other variables. This method is also known as "one-at-a-time perturbation" or "parametric analysis."

Figure 9-1: Sensitivity Chart for Net ACE Benefits (PV $M)



The following tornado chart and table describe the sensitivity analysis for Net ACE Benefits (PV $M). The economic cost reduction (for drug related economic costs) has the largest impact on the output. If that input is 0.1%, then Net ACE Benefits (PV $M) are approximately $3.1 billion. (See Figure 9-2 and Table 9-1.)

[52] The rank correlation measures in the sensitivity chart are presented in descending order.
[53] ACE Net benefits are defined as the difference between ACS costs and ACE costs plus any differential benefits associated with ACE.

Figure 9-2: Tornado Chart – Impact on Net ACE Benefits (PV $M) from Changes in Key Inputs

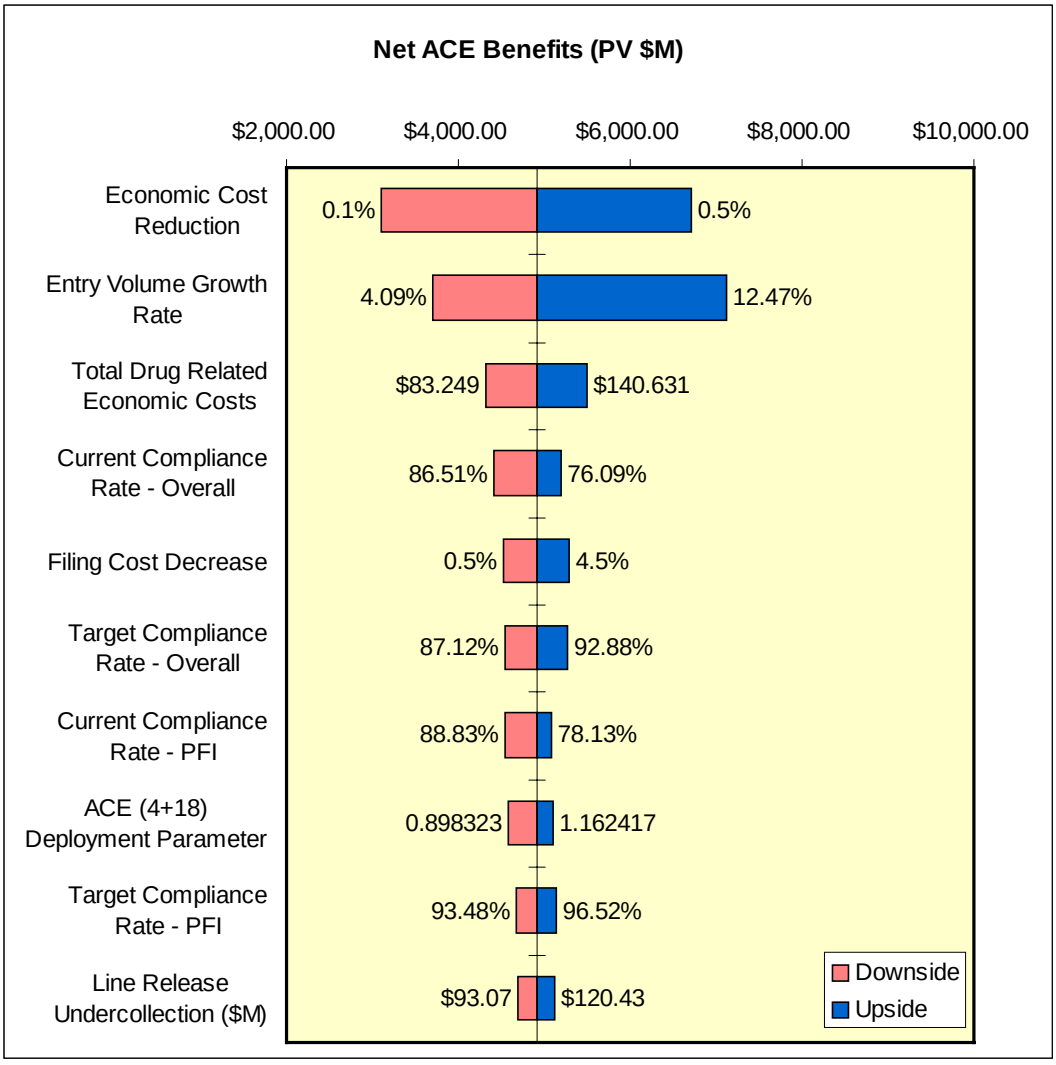


Table 9-1: Tornado Chart Analysis for Net ACE Benefits (PV $M)

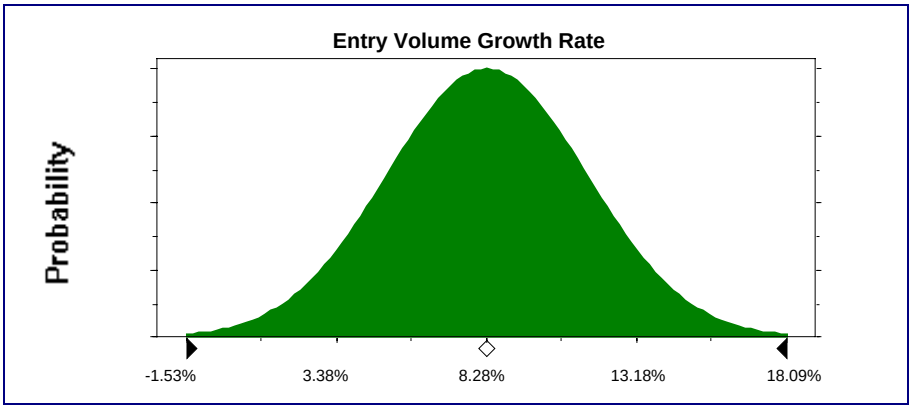
	Total ACE Benefits			Input		
Variable	Downside	Upside	Range	Downside	Upside	Base Case
Economic Cost Reduction	$3,094	$6,719	$3,624	0.1%	0.5%	0.3%
Entry Volume Growth Rate	$3,692	$7,123	$3,431	4.1%	12.5%	8.3%
Total Drug Related Economic Costs	$4,326	$5,487	$1,161	$83	$141	$112
Current Compliance Rate - Overall	$4,407	$5,188	$781	86.5%	76.1%	81.3%
Filing Cost Decrease	$4,517	$5,296	$778	0.5%	4.5%	2.5%
Target Compliance Rate - Overall	$4,534	$5,279	$745	87.1%	92.9%	90.0%
Current Compliance Rate - PFI	$4,545	$5,091	$546	88.8%	78.1%	83.5%
ACE (4+18) Deployment Parameter	$4,577	$5,098	$522	0.898	1.162	1.030
Target Compliance Rate - PFI	$4,677	$5,136	$460	93.5%	96.5%	95.0%
Line Release Undercollection ($M)	$4,682	$5,131	$448	$93	$120	$107

9.2 Risk Analysis

Developing probability distributions for inputs to describe the uncertainty or variability of the data generates risk analysis results. This process is in contrast to the usual practice of developing

a single point estimate. For example, it is expected that the input Entry Volume Growth Rate will fall within a range of -1.53% to 18.09%, with a mean value of 8.28% and standard deviation of 3.27%. This range describes a normal probability distribution pictured below. To be "normally distributed" means the upper and lower values are equidistant from the median value. Thus, for this input a normal probability distribution was selected to describe the uncertainty or variability for this input.

Figure 9-3: Entry Volume Growth Probability Distribution



9.2.1 Developing Input Ranges for the Cost Data

9.2.1.1 Parameters and Values Affecting Risk

To complete the estimates developed earlier, allowances must be given to account for the risks inherent in delivering a new hardware and software system. This sub-section discusses the risks associated with development programs of this nature, and in particular, with respect to ACE. This analysis relies upon the Cost Analysis Manual prepared by the U.S. Army Cost and Economic Analysis Center.[54]

The Cost Analysis Manual offers a thorough examination of risk in cost estimating. It begins with a discussion of risk and uncertainty, stating that the term "risk" applies to situations that are well enough understood that probability distributions can be calculated. A significant amount of repeated data is necessary to quantify risk. Uncertainty exists when the probability distribution is unknown; where there is insufficient repeated data to establish the distribution. For one-of-a-kind developments, uncertainty is more often applicable than is risk.

In these cases, the rigorous mathematical approaches to risk analysis are not supported by data, and other methods must be used. The term risk analysis also applies to studies involving large amounts of uncertainty. In this study, the application development is unique and the relevant historical data needed for rigorous analysis is lacking. There is still sufficient general information to make a reasonable estimate without a full statistical modeling of risk.

[54] *Cost Analysis Manual*, Department of the Army, U.S. Army Cost and Economic Analysis Center, Falls Church, VA, July 1997.

The manual goes on to identify four types of performance-related risk that are applicable to this program. They are important because uncertainties associated with schedule and costs stem from these performance risks. Each of these risks was individually assessed in developing the risk factors for these estimates.

- Technical risk can be considered the risk associated with the evolution of a design process to achieve a higher level of performance than was previously demonstrated. If the technology improvements lie within the state of the art, then the risk is relatively low. If the desired performance requires the development of new technology, then risk is substantially higher.

- Configuration risk is the risk that the physical or performance characteristics of the system will evolve. There are several reasons why this risk could occur. Initial requirements may not have been thoroughly understood, or they may change, prompting revisions to hardware and capabilities. The original designs and concepts may not produce the desired results.

- Supportability risk is associated with the installation and maintenance of the system. Some areas of consideration are the maintenance of hardware and software, training, facilities, and interface with clients and other organizations.

- Programmatic risk refers to policy, management, and budgetary changes that could affect the schedule or scope of the effort. These risks originate outside the program office's span of control.

The program office's management practices have a significant impact on the risk assigned to an estimate. The management office should have a risk management and mitigation plan that includes the following items:

- Identification of risk;

- Assessment of risk probabilities and their effects on the project;

- Strategies to mitigate identified risks;

- Monitoring of risk factors/metrics;

- Risk thresholds and procedures to invoke emergency/crisis plans; and

- Crisis plans and their management.

Software development cost estimating requires special scrutiny because this area has a high potential for cost overruns. There are several metrics to be considered in forming an estimate in this area. The Cost Analysis Manual cites these:

- Are metrics used to track software development efforts or does the developer assess the progress?
- Are development efforts on schedule? Have there been schedule problems?
- What is the Software Engineering Institute (SEI) maturity level of the software developers?
- What tools are the developers using?
- What is the defect ratio?

Another indication of the risk on a program is the performance that the contractor has demonstrated to date. The contractor's compliance with budget, schedule, and deliverables performance, as outlined above is an indication of the risk on a program.

9.2.1.2 Risk Analysis

Appropriate risk ranges for the cost inputs were developed through a hybrid approach that combined subjective estimating judgment with an executive panel. The ACE application development cost estimate is based upon three models: a Business Complexity Analysis, a Parametric Model, and a Function Point Analysis. Each estimator used the metrics and industry standards for their area to develop their estimates. Each had a unique view of this project with respect to development risks.

The risk assessments were accomplished by forming a panel to discuss and weigh the risks in each area. The discussions and results are presented below. Performance and management were assessed in terms of technical, configuration, supportability, and programmatic risk. The ACE system represents a fairly compressed schedule. In general, the risks associated with a compressed schedule would be more severe than those of a less aggressive program schedule.

Risk in each area was assessed as high, medium, or low. High risk reflects a probability that an event is likely to occur and that there will be a substantial increase to the schedule and/or budget. Moderate risk indicates a reasonable chance of occurrence with modest cost and/or schedule impacts. This assessment also includes a situation of high probability of occurrence with small consequences and low probability of occurrence with grave consequences. Low risk involves both low probability and mild consequences.

- *Technology*—The technology in ACS and ACE do not push the limits of the state of the art. However, it is highly complicated and widely dispersed. It must be completely reliable. The ACE development program has less risk of becoming obsolete before the system is completely fielded. The risk in this area is moderate. ACS does rely upon older proven technology to which primarily capacity upgrades are anticipated to maintain existing performance. As a result the risk rating is low.
- *Configuration*—The ACE software configuration risk is considered to be high, in that the initial requirements are not thoroughly articulated, and therefore are almost certain to

change. The ACE infrastructure configuration risk is rated moderate as there is an understanding of the initial business requirements and the technology necessary to achieve those requirements (see Appendix I). However, the envisioned technical architecture may not fully achieve the business goals and may change as the software functionality evolves. ACS configuration risk is rated low as existing functionality and performance are being maintained as consistent with the base case definition. As a result the physical and performance characteristics of the system are unlikely to change substantially.

- *Supportability*—The supportability of ACE components should be low risk. Ensuring maintenance quality control and software configuration management at all locations may be challenging. A longer development program could be expected to incur more supportability problems in the latter years, while the shorter development program requires the prompt establishment of a support structure. Supportability risk for ACS is considered moderate, as much of the software has not been fully documented. This affects the ability to maintain the system across time, especially as key personnel with institutional knowledge retire.

- *Programmatic*—Budgetary inconsistency is the major programmatic risk. This risk is beyond the control of the USCS, but nevertheless could have significant consequences. A longer development program would be more likely to experience budget disruptions, but variations to the shorter development program could be more detrimental to that critical path. Programmatic risk is considered moderate for both ACE and ACS.

As described, performance risk consists of technical, configuration, supportability, and programmatic risk. Each of these was assessed independently by the expert panel. Low risk had a multiplier of 1.03, moderate risk 1.06, and high risk 1.10. Configuration risk is already included in the software, infrastructure, and NDC estimates so they are not included in the factor calculations below. Because performance risks can compound each other, it is proper to multiply their individual factors to arrive at a total performance risk factor as shown in the product line below.

Table 9-2: Performance Risk Derivation

	ACS		ACE	
Risk Category	**Risk Level**	**Factor**	**Risk Level**	**Factor**
Technical	Low	1.03	Moderate	1.06
Configuration[55]	Low		High	
Supportability	Moderate	1.06	Low	1.03
Programmatic	Moderate	1.06	Moderate	1.06
Product		**1.16**		**1.16**

[55] Configuration risk, which considers requirements understanding and creep, is included in each software estimation model and the base case and ACE infrastructure estimates. The BCM software model applies 10% configuration risk, the Parametric and Function Point models each assume a 15% value. The base case infrastructure assumes a low risk level and therefore a 3% configuration premium while the ACE alternative assumes a moderate risk level resulting in a 6% risk premium.

Management risk is assessed separately from performance risk. The impact of management risk is greater than any one of the performance risk parameters and is more or less equivalent to the total performance risk. Rationale for the ACS and ACE management risk scores is provided below.

- *Management*—Contracting-out the independent oversight of the ACE development is a significant risk-reducing measure. An independent contractor is assumed to be capable of mitigating and managing the risk areas above. For the Government's part, contracting these programs in a timely manner is almost always a challenge. While the longer development program would be more likely to experience turn over of key personnel, the shorter development program requires a fast start with little room for error. In a large, unique, widely dispersed, and lengthy program, the ACE management risk is high. However, as the ACS system is a legacy system some management related risks have been reduced through experience gained during the systems life. ACS risk is rated moderate.

The following table displays the results of the risk assessment. The risk factors below are used to develop appropriate ranges for the cost inputs in the analysis.

Table 9-3: ACS and ACE Development and Deployment Program Risk Factors

Risk Category	ACS	ACE
Performance	16%	16%
Management	10%	20%
Risk Factor	28%	39%

Note: Risk Factor = [(1 + Performance Risk) * (1 + Management Risk)] - 1.

9.2.2 Developing Input Ranges for the Benefit Drivers

Establishing the appropriate range for the assumptions related to benefit drivers is based on quantitatively and qualitatively assessing a number of factors including:

- The historical and expected variability of an input value;
- The robustness of the historical data;
- The institutional barriers to changing business processes;
- Learning curve effects;
- Political barriers; and
- Institutional lethargy.

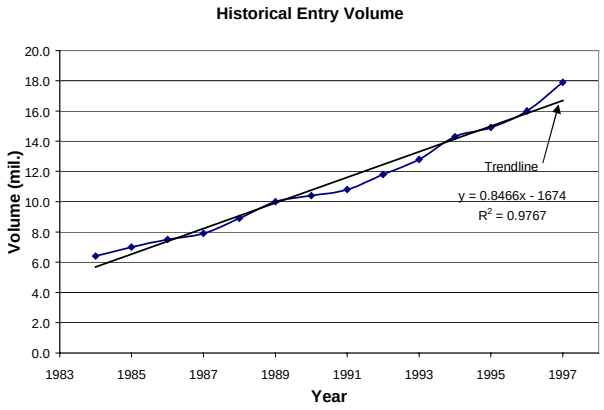
To illustrate the process by which input ranges are established two examples are provided. The first is for the Entry Volume Growth input (see Figure 9-3) and the second is for the Border Cargo Selectivity Time Savings input (the third step in the Cargo Release Process). The first example demonstrates the use of historical data and is more quantitative in nature and the second demonstrates the use of limited data and reasoned judgement and is more qualitative in nature.

The historical data used to develop the Entry Volume Growth input is presented in Table 9-4 and graphed in Figure 9-4. Using this data, the average entry volume growth can be estimated (8.28%) and the standard deviation can be estimated (3.27%). The data and graph indicate that the growth trend is quite stable as demonstrated by the linear trendline with a R^2 value of 0.98 and that this growth trend should continue in the future. In addition, it is equally likely that future growth will exceed or fall short of the historical average. Using these data points a normal distribution for the input is utilized with a mean value of 8.28% and standard deviation of 3.27%. The distribution is pictured in Figure 9-3.

Table 9-4: Historical Trade Volume Data

Year	Entry Volume (mil.)	% Change
1984	6.40	
1985	7.00	9.37%
1986	7.50	7.14%
1987	7.90	5.33%
1988	8.90	12.66%
1989	10.00	12.36%
1990	10.40	4.00%
1991	10.80	3.85%
1992	11.80	9.26%
1993	12.80	8.47%
1994	14.30	11.72%
1995	14.90	4.20%
1996	16.00	7.38%
1997	17.90	11.88%
Average		8.28%
Standard Deviation		3.27%

Figure 9-4: Historical Trade Volumes



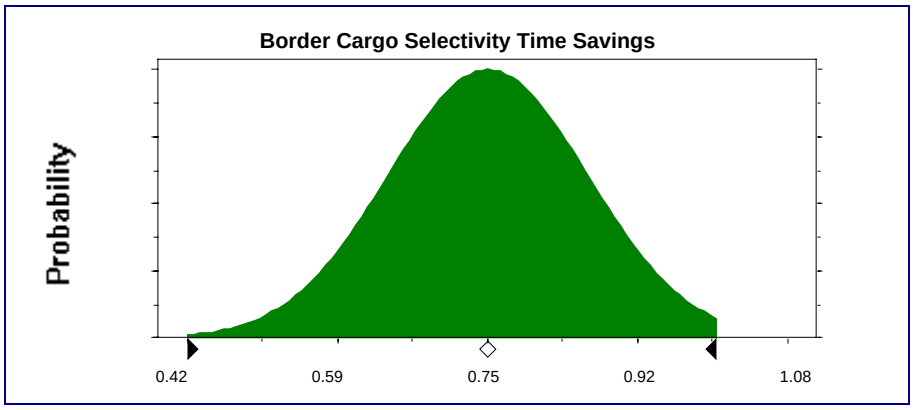
The second example is the distribution for the input Border Cargo Selectivity Time Savings. This input represents the time savings associated with the third step in the Cargo Release Process that consists of receiving the entry, keying in the entry number, comparing the screen to entry, writing the batch and sequence number on entry, and signing-off on the invoice. This step is repeated 3,900,648 times per year and currently takes approximately one minute to complete with ACS. The expected time saving with ACE is 0.75 minutes because the data will be received electronically. Using these numbers a distribution for the Border Cargo Selectivity input (the new processing time) is established.

Since there is no historical data to rely on, a qualitative assessment of the current data and the potential improvement is necessary. First, the proposed change from manual to electronic processing will have a positive impact on processing times and it is highly unlikely that time savings will be less than zero (i.e., degrade from the current processing time of one minute). It is more likely that time savings will occur but could be less than anticipated by as much as 50% (i.e., time savings could be as low as 0.42 minutes). Secondly, the time savings can not exceed one minute so this defines the lower bound of the distribution. Finally, without additional data it is assumed that it is equally likely the true value will fall above or below the estimated value (a normal distribution).

This qualitative assessment defines the boundary and the type of distribution from which the model can draw values to populate the mathematical equations. Providing a range of possible values allows the model to estimate the range of possible outcomes given the inputs variability and uncertainty. The distribution for this input is presented in Figure 9-3. As the figure shows

the range established for this input is from 0.42 minutes to 1 minute with a mean value of 0.75 minutes. The right tail of the distribution is truncated at the 1 minute mark because time savings can not exceed the current ACS processing time.

Figure 9-5: Border Cargo Selectivity Time Savings Probability Distribution



9.2.3 Calculating Results

Once the procedure of assigning probability distributions is complete, a Monte-Carlo simulation is run. During a Monte-Carlo simulation, each probability distribution is sampled and a unique value is obtained. These numbers are used to populate the mathematical equations in the CBA methodology. A simulation trial concludes when the equations are solved and results are calculated. This procedure is repeated depending upon the number of trials selected. After repeated samplings, a probability distribution for each result metric is generated. Thus, for each result there is not only an estimate of its value, the mean, but the probability associated with that outcome. For example, this model's results indicate an 80% probability that Net ACE Benefits without external benefits will lie between $0.7 and $4.4 billion.

9.2.4 Interpreting Risk Analysis Results

A number of values are generated for each model result, such as the mean, the standard deviation, the median value, the range minimum, and range maximum. The mean value may differ from the median value if there is skew in the probability distributions of the model inputs (non-normal distributions). This occurs because the mean value is the average of all the simulation trials while the median is the value between the range minimum and maximum.

The histogram, pictured below, is a graphic representation of a probability density function which is defined by meeting two requirements: $0 \le p_i \le 1$, and $p_i = 1$, where i = the number of trials in the simulation. The probability density function for a result is derived from the results of a simulation.

Each simulation trial ends with a value being calculated for each result metric. Associated with this result is a probability value, which is defined as $p_i = \frac{1.0}{i}$. As results are calculated they are sorted into bins or numeric intervals, with the probability associated with that result adding to the

probabilities of the other results that fell in the bin. Bins are defined as an equal part of a numerical range that is determined from the range of results calculated. After a simulation is complete, the resulting graph of all the bins will resemble the graph pictured below.

Figure 9-6: Frequency Chart for Net ACE Benefits including External Benefits

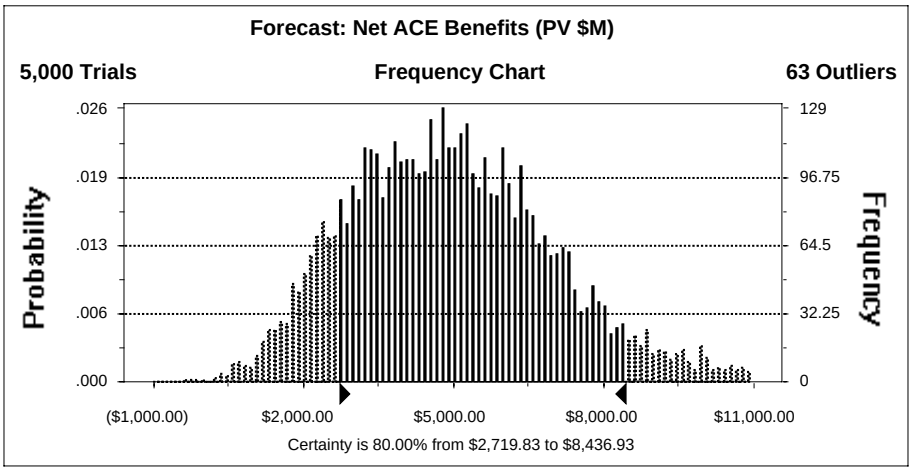
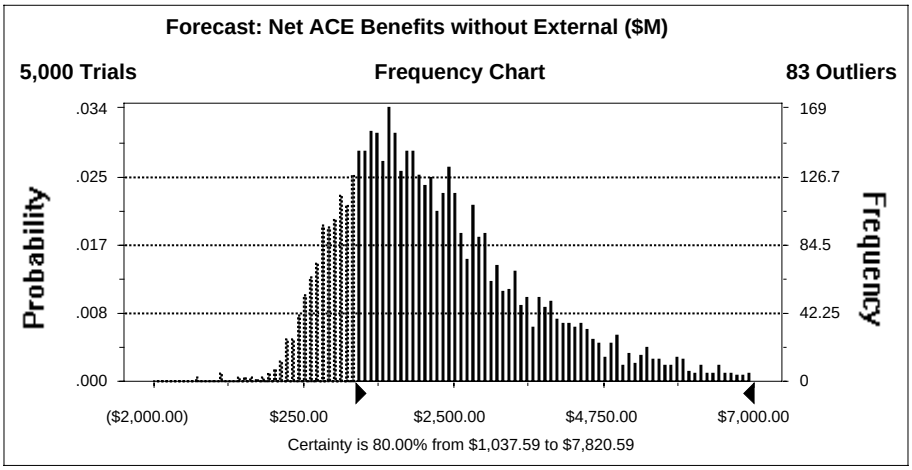


Figure 9-7: Frequency Chart for Net ACE Benefits without External Benefits



9.2.5 Risk Analysis Results

The risk-adjusted mean values as well as the mean values are presented in the following tables. In addition, the standard deviation, generated during the simulation, for the risk-adjusted mean values is shown. As the table shows, the range of possible outcomes is wide. While there is a significant uncertainty in analysis inputs, there is virtually no chance (i.e., around one percent) of NPV being negative, even without external benefits.

The tables also present the standard cost-benefit evaluation and ranking measures for the ACE investment. The primary evaluation metric is net present value. As the table shows, including external benefits substantially increases the NPV and ROR, but the standard deviation increases

significantly indicating that the range of outcomes is greater. Regardless of whether external benefits are included, the NPV is positive and the ROR far exceeds the 7.0% discount rate.

Table 9-5: Risk Analysis Results (Excluding External Benefits)

	CBA Analysis Results		
		Risk Adjusted	
	Mean Value	Mean Value	Standard Deviation
Total ACS Life Cycle Costs (PV $M)	$1,193	$1,523	$35
Total ACE Life Cycle Costs (PV $M)	$1,820	$2,533	$48
ACE Benefits (PV $M)	$3,246	$3,338	$494
Net Present Value (PV $M)	$2,619	$2,328	$1,634
Rate of Return (%)	20.5%	13.7%	4.1%
Benefit-Cost Ratio	5.2	3.3	1.8
Payback Period (Years)	11	17	4

Note: The benefit-cost ratio is calculated by dividing ACE Benefits (without external benefits) by the difference between ACE life cycle costs and ACS life cycle costs. NPV is calculated by subtracting the difference between ACE life cycle costs (PV) and ACS life cycle costs (PV) from ACE benefits (PV).

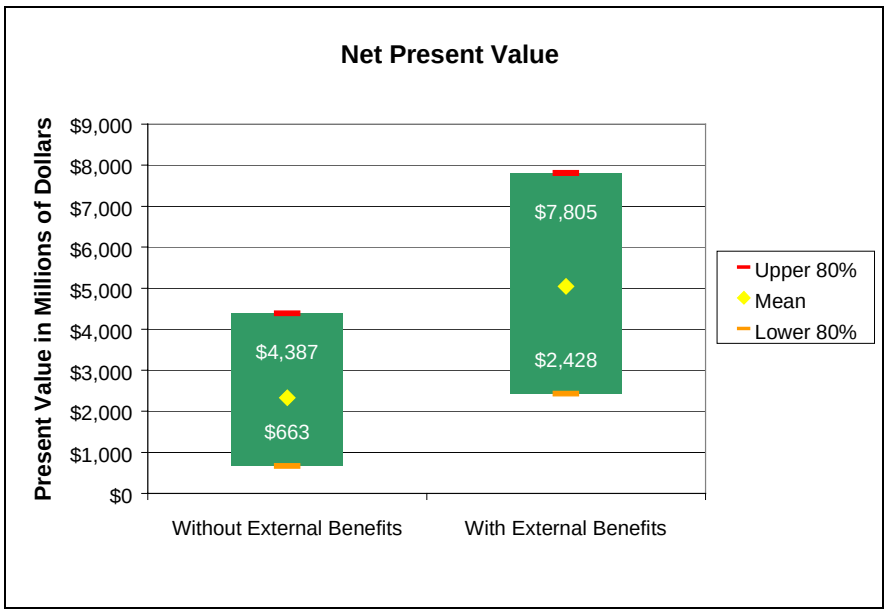
Table 9-6: Risk Analysis Results (Including External Benefits)

	CBA Analysis Results		
		Risk Adjusted	
	Mean Value	Mean Value	Standard Deviation
Total ACS Life Cycle Costs (PV $M)	$1,193	$1,523	$35
Total ACE Life Cycle Costs (PV $M)	$1,820	$2,533	$48
ACE Benefits (PV $M)	$5,125	$6,056	$2,183
Net Present Value (PV $M)	$4,497	$5,046	$2,185
Rate of Return (%)	28.1%	21.9%	5.0%
Benefit-Cost Ratio	8.2	6.0	2.3
Payback Period (Years)	8	10	3

Note: The benefit-cost ratio is calculated by dividing ACE Benefits (with external benefits) by the difference between ACE life cycle costs and ACS life cycle costs. NPV is calculated by subtracting the difference between ACE life cycle costs (PV) and ACS life cycle costs (PV) from ACE benefits (PV).

The following figures present the standard cost-benefit evaluation and ranking measures for the ACE investment in graphic format. The graphs portray an 80% confidence interval for each metric. There is an 80% probability that the result will fall within the upper and lower limits shown. The risk-adjusted mean value is taken from the previous two tables. As the figures show the range around the mean estimates is significant especially when external benefits are included.

Figure 9-8: Risk-Adjusted Net Present Value

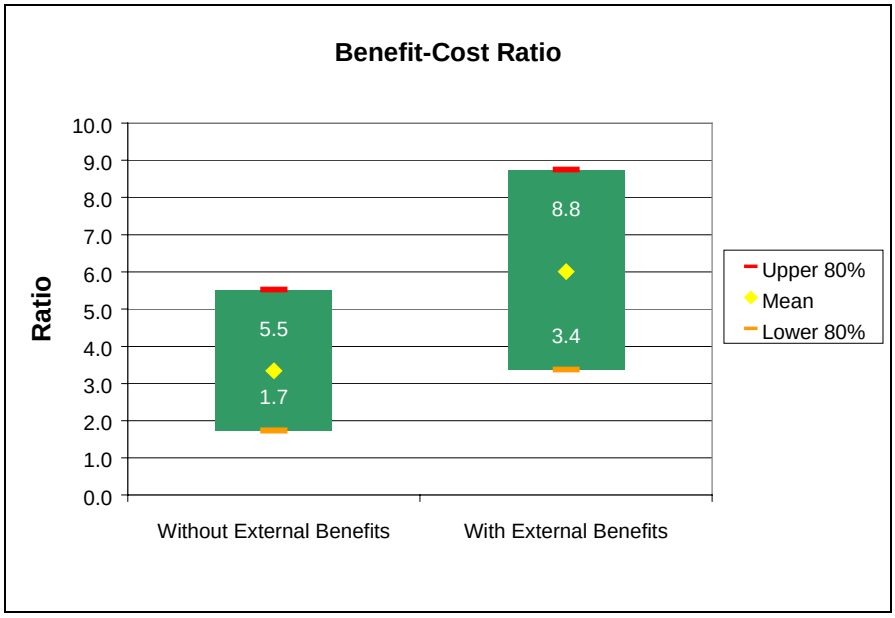


The secondary CBA measures, such as ROR, BCR, and payback period, also support an ACE investment. Figure 9-9 demonstrates that the ROR easily exceeds the discount rate of 7%, as shown below, offering further evidence that an investment in ACE is warranted.

Figure 9-9: Risk-Adjusted Rate of Return

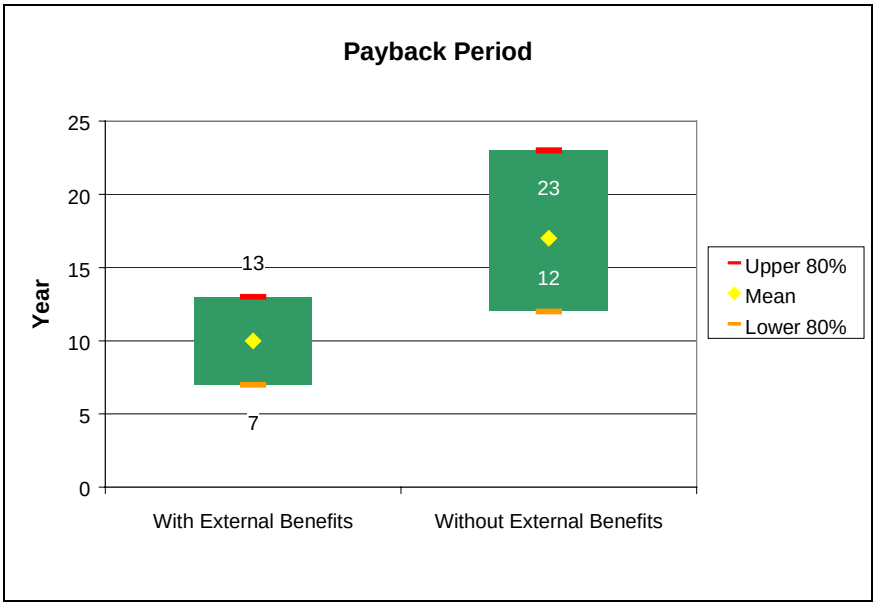
As depicted in Figure 9-10 below, the ACE BCR clearly exceeds a value of one, further supporting an investment decision.

Figure 9-10: Risk-Adjusted Benefit-Cost Ratio



The following figure depicts the expected range of the ACE payback period, which represents the number of years for capital to be recouped through the flow of benefits. This value is the number of years from the start of the analysis period (FY 2000) and not when the system goes active (FY 2004). The lower 80% value represents the possibility of a shorter payback period and could arise if there are no delays implementing the system and/or benefits exceed the mean expected values. A payback period shorter than the ACE life cycle supports the investment.

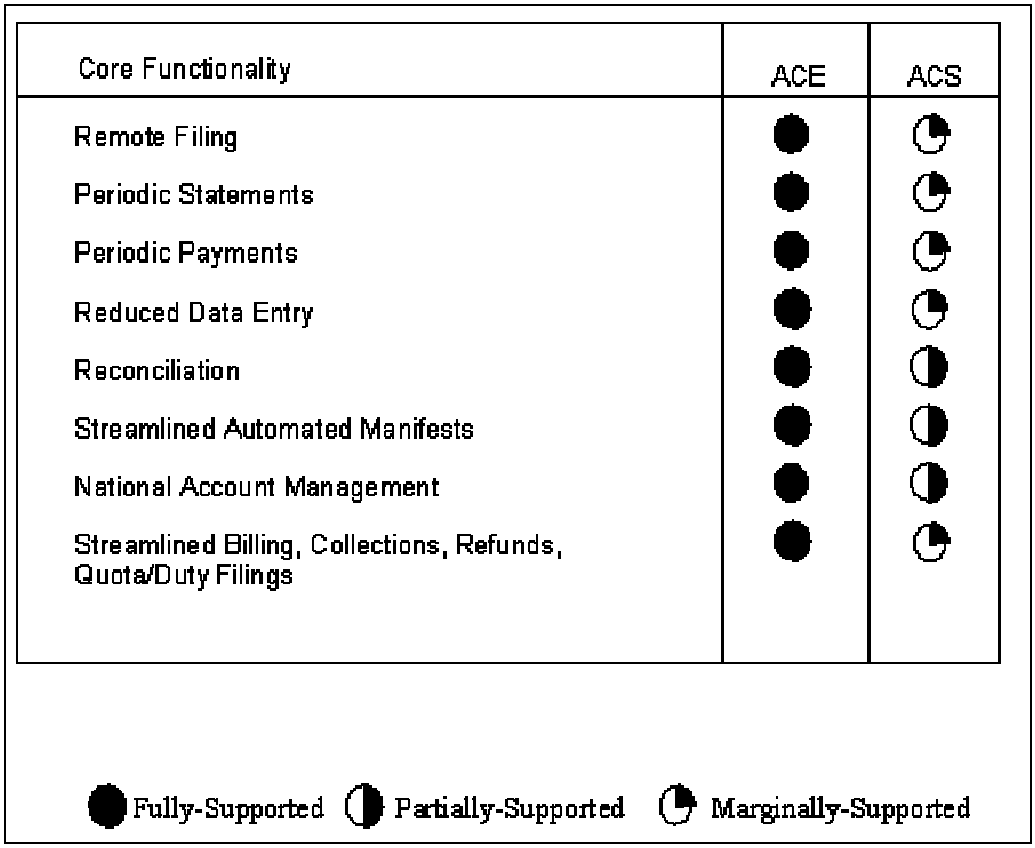
Figure 9-11: Risk-Adjusted Payback Period



9.3 Functional Comparison

From the business and technical advantages and disadvantages described in Sections 4, 5, and 6 it is evident that ACS will not fully achieve the functionality intended by legislation. As shown in the figure below, the ACS business and technical constraints result in the legacy system's ability to achieve some but not total legislative compliance.

Figure 9-12: Capability to Achieve Legislated Functionality



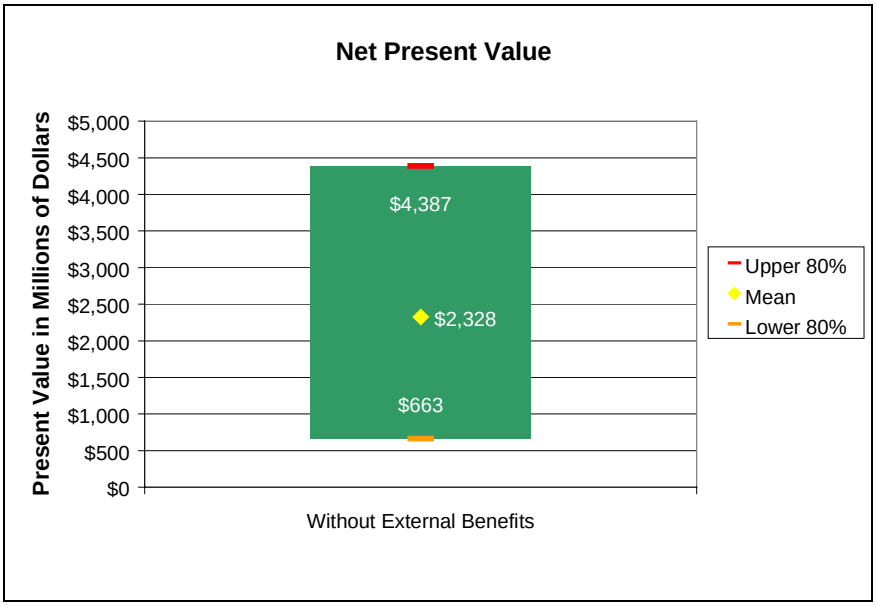
10 Recommendation

This analysis evaluates the ACE replacement alternative relative to the current ACS system. The financial, strategic, and technical results all support an ACE investment. The results of the economic analysis are presented in Section 9. However, key strategic findings from the trade community detailed in Section 8 and ACS business and technical constraints summarized in Sections 4 and 5 are relevant to investment and policy decision makers.

10.1 Investment Decision Criteria

The economic value of ACE is assessed on one key CBA measure: risk-adjusted NPV. The more positive the value, the more viable the investment. As shown below, the ACE alternative has an 80% probability of achieving a significant NPV over its 22-year operational life and virtually no chance of being less than zero. Other metrics, such as risk-adjusted ROR, payback period, and BCR also provide insight into the investment's performance across time. These metrics should be used to provide additional information about the investment and should not be used as the sole basis to justify the investment decision.[56] Supporting calculations and additional risk and sensitivity analysis results are provided in Section 9.

Figure 10-1: Risk-Adjusted Net Present Value



These secondary CBA metrics also support an ACE investment. If the ROR exceeds the discount rate of 7% it warrants an investment. Should the BCR be greater than one, an

[56] Substantial research supports using NPV as a basis for assessing investments. There are common instances where an NPV conclusion will conflict with IRR, payback period, and BCR results. In these instances, it is recommended that the NPV conclusion prevail.

investment decision is supportable. Payback periods shorter than the projects life cycle also support an investment.[57] This is the case as shown below:

Figure 10-2: Risk-Adjusted Rate of Return

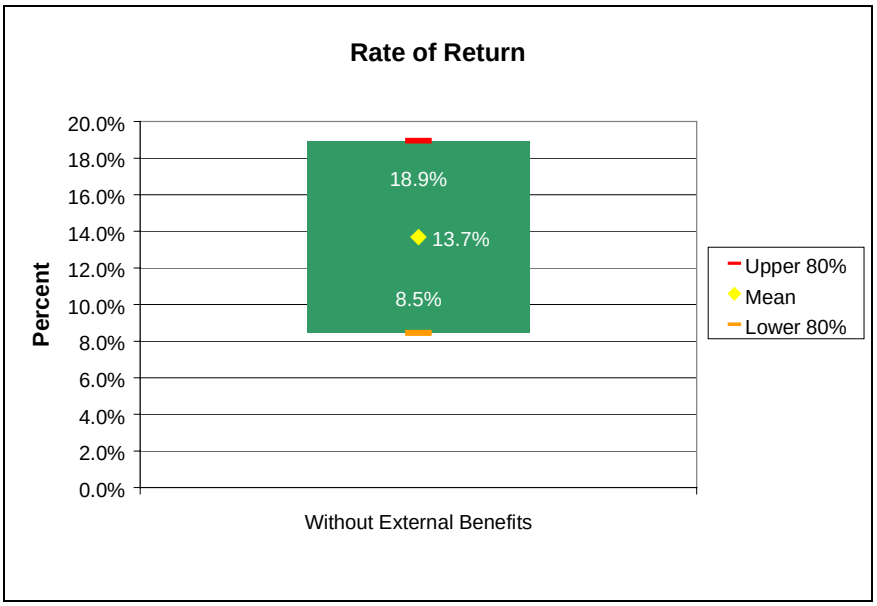
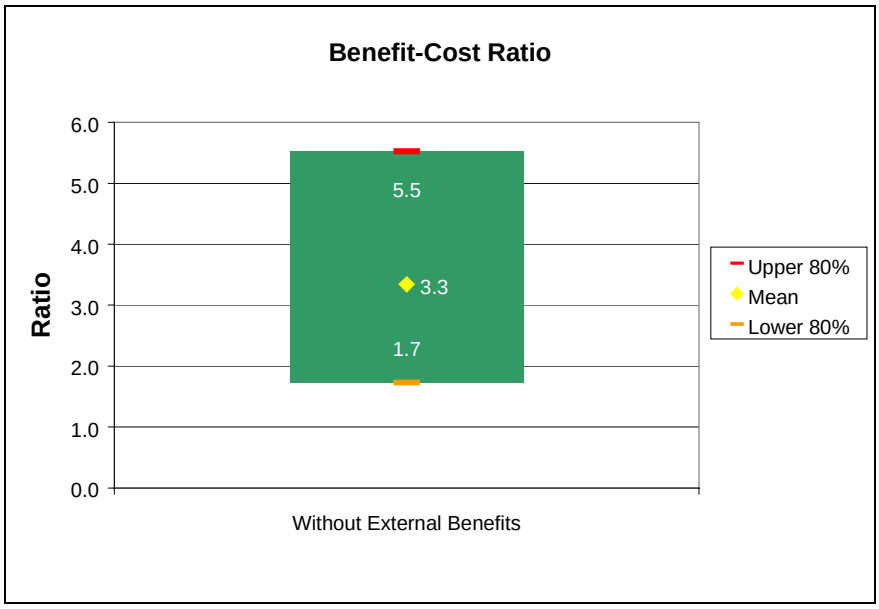
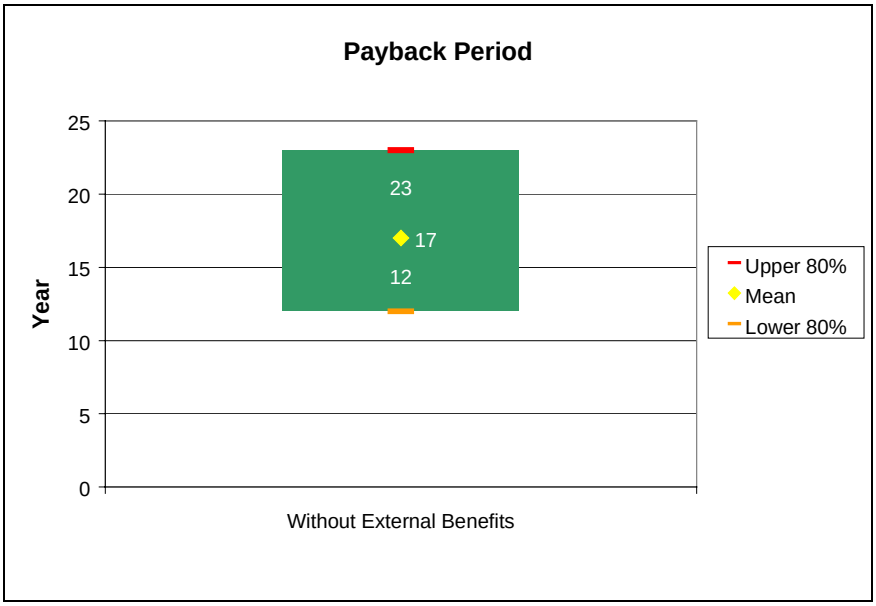


Figure 10-3: Risk-Adjusted Benefit-Cost Ratio



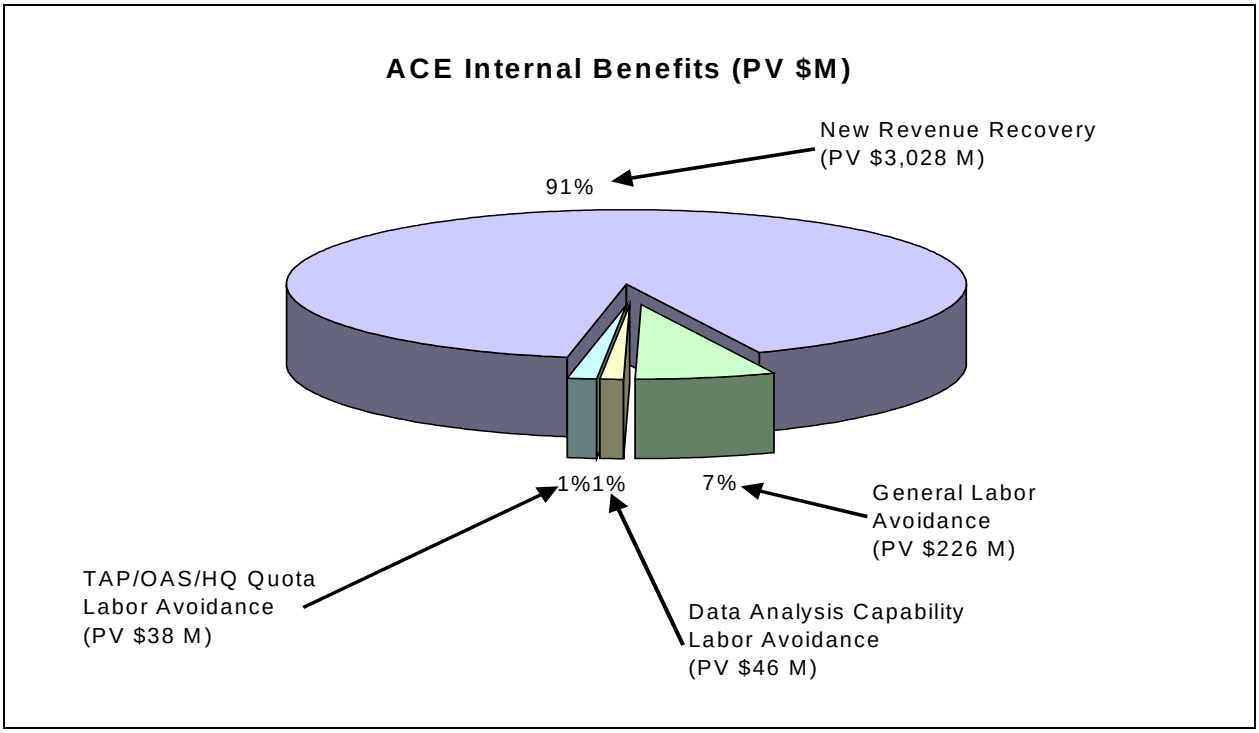
[57] The payback period represents the number of years for capital to be recouped through the flow of benefits. The value is from the start of the analysis period (FY 2000) and not when the system goes active (FY 2004). The lower 80% value represents the possibility of a shorter payback period and could arise if there are no delays implementing the system and/or benefits exceed the mean expected values.

Figure 10-4: Risk-Adjusted Payback Period



Internal benefit findings are often subject to scrutiny when savings result from benefit categories such as labor avoidance, which do not reflect a direct cash inflow and may be considered a "soft savings." As the pie graph in Figure 10-5 demonstrates, the overwhelming majority of benefits result from revenue recovery and only a small percentage accrues from labor avoidance.

Figure 10-5: Distribution of Risk-Adjusted Internal Benefits by Category



Quantifiable external benefits are typically not included in investment calculations, but do convey enriching detail. This is particularly useful when evaluating an investment's public policy effects.[58] This analysis found that over 22 years, reduced transaction costs may benefit the trade community by $973 million. In addition, societal benefits accruing from enhanced narcotic interdiction activities may reach $906 million over the same time period. The range of uncertainty contained in external benefit calculations is broad. Investment metrics containing quantifiable external benefits are detailed in Section 9.

10.2 Non-Quantifiable Strategic Findings

Beyond the economic justification established, non-quantifiable internal and external findings have strategic significance. The principal non-quantifiable internal benefit is that ACE brings the USCS trade management program into legislative compliance while increasing processing speed, data accuracy, system reliability, interoperability, and user friendliness for all stakeholders.

The proposed ACE system also offers significant technical and business advantages over the 15-year-old legacy system. Beyond complying with the Mod Act and other relevant legislation, the ACE system:

- Increases flexibility and enables a “plug & play” technical environment;
- Improves interfaces with the trade community and other government agencies;
- Increases productivity allowing faster information processing;
- Improves analytical capabilities;
- Supports new and enhanced business requirements; and
- Applies industry standards and competitive vendor support contracts to minimize development costs.

Non-quantifiable external benefits also support replacing ACS. After conducting interviews with and reviewing written responses from the trade community, three principal themes emerged:

- USCS is part of a larger logistics chain that is being modernized at each stage;
- The current ACS system should be replaced with an advanced, integrated system as soon as possible; and
- Trade community savings from a new system are difficult to quantify, but are expected to be significant.

[58] The external benefit results presented in this paragraph are not risk-adjusted.

The first theme is that importers, brokers, manufacturers, carriers, and insurers view USCS as one part of the overall logistics chain and they want to modernize their systems to ensure that USCS is not an impediment to their business. Many companies are waiting for a new USCS system so they can modernize their systems accordingly, while other companies are in the midst of modernizing and need to know how they will link to USCS. The community believes that their way of conducting international trade has irreversibly changed and USCS must become part of the modernized trade process.

The second theme is that the current system must be replaced as soon as possible. The slowdowns and occasional system downtime has given users a glimpse of what effects a complete system failure would have on their operations. The trade community clearly favors a course of action that would achieve an advanced, integrated system in the near term.

Finally, the trade community is not able to provide specific estimates of savings because ACE has not been fully defined. Some functionality that has been articulated, such as remote location filing and periodic entry summary payment, has been enthusiastically endorsed. Those changes are enough for the trade to conclude that there will be significant savings when an alternate system such as ACE is implemented.

10.3 Recommendation

This CBA firmly supports the conclusion that ACE should replace ACS. The positive NPV and other CBA metrics indicate ACE is a worthy investment. In addition, the proposed ACE system offers significant technical and business advantages over the 15-year-old legacy system.

An analysis of external users further supports this conclusion. The trade community views USCS as a link in the overall logistics chain that must be modernized as soon as possible given the effects ACS downtimes and slowdowns have upon commercial activities. The trade community also notes that while savings from a new system are difficult to quantify, they are expected to be significant.

The economic and strategic findings detailed in this CBA support replacing ACS with an ACE solution.